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RECONNAISSANCE OF MINING DISTRICTS IN CHURCHILL COUNTY, NEV.

BY

WILLIAM O. VANDERBURG

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

RECONNAISSANCE OF MINING DISTRICTS IN CHURCHILL COUNTY, NEV.[1]

By William O. Vanderburg[2]

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[2] Mining engineer, Mining Division, Bureau of Mines, U. S. Department of the Interior.

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INTRODUCTION

This report[3/] gives the results of a reconnaissance of the mining dis-icts in Churchill County, Nev., made in the fall of 1938 and spring of 39. All of the mining districts in the county were visited, but no tempt has been made to include all the mines and prospects within the ea; inclusion or omission of a property in this paper has no bearing on s merits. The report gives the situation of the various districts, neral production, and ownership of properties; describes the ore deposits, nes, and prospects; contains information on past and current activity; d includes other data likely to be useful to those interested in the velopment of our mineral resources.

The various districts were named when they were organized for purposes record and regulation. When established, the districts embraced large eas without well-defined borders, so that the names have little geographical gnificance.

As a result of the mining activity in the Comstock and Reese River stricts in Nevada, considerable prospecting in Churchill County took ace in the sixties and seventies. A number of districts were organized, t no outstanding metal discoveries were made until 1905 and 1906, when ch silver-gold deposits at Fairview and Wonder were found. The Nevada nder mine in the Wonder district and the Nevada Hills mine in the Fairview strict have been the principal producers in the county. With exhaustion ores in these two properties about 1920, mining activity declined. rrent mining activity consists largely of the operations of lessees; e ores produced are shipped either to smelters in Salt Lake Valley, ah, and McGill, Nev., or to a local custom milling plant recently erected Westgate in the southeastern part of the county.

In the industrial mineral group, salt for metallurgical use was an portant commodity produced from the salines in Churchill County in the st. Sodium carbonate and borax also were produced in commercial quantities former years.

Manuscript completed May 25, 1939.

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ACKNOWLEDGMENTS

The author wishes to thank the owners, lessees, and mine operators, too numerous to mention individually, who furnished aid and information during the course of the field work. Special thanks are due John T. Reid, Lovelock, Nev., who kindly furnished data of historical nature on the old mining districts in the Stillwater Range.

B. F. Couch, secretary of the Nevada State Bureau of Mines, Reno, Nev., made available published data pertaining to former mining activities within the county; credit for such data as were used is given in the text. Charles White Merrill, of the Mineral Production and Economics Division, Bureau of Mines, compiled the figures for the mineral-production tables for the Wonder and the Fairview districts, and for Churchill County.

CHURCHILL COUNTY

Political History

The region within the present boundaries of Nevada originally comprised part of the territory acquired by the United States from Mexico under the treaty of Guadalupe Hidalgo signed in 1848. After its acquisition by the United States, it constituted the western part of the Territory of Utah, from which it was separated by an Act of Congress approved March 2, 1861, to form the Territory of Nevada. The territorial status was maintained until October 31, 1864, when, by proclamation of President Lincoln, it was admitted into the Union as the thirty-sixth State.

Churchill County is one of the nine original counties created by Territorial Act approved November 25, 1861. As created, the county was considerably larger; its size was reduced by cessions of land to Lander County on December 12, 1862; to Lyon County, February 20, 1864; and to Nye County, March 5, 1869. In February 1869 a small triangular tract was withdrawn from Humboldt County and ceded to Churchill County, making the boundaries as shown in figure 1.

When Churchill County was created, it was officially attached to Lyon County for judicial and revenue purposes, and a joint county seat was established at Buckland Station (later Fort Churchill). On February 20, 1864 Churchill County was separated from Lyon County, and in April of the same year La Plata, on the east side of the Stillwater Range, was designated the county seat. In 1868 the county seat was moved to Stillwater, on the west side of the range 18 miles west of La Plata, where it remained until 1908, when it was moved to Fallon.

Churchill County derives its name from Fort Churchill, United States military post from 1860 to 1870, situated in Lyon County west of the present county line. It has an area of 5,091 square miles and a population of 5,075, according to the census of 1930. Most of the population resides in Fallon, the county seat and supply center for the ranches and mining districts within a radius of many miles.

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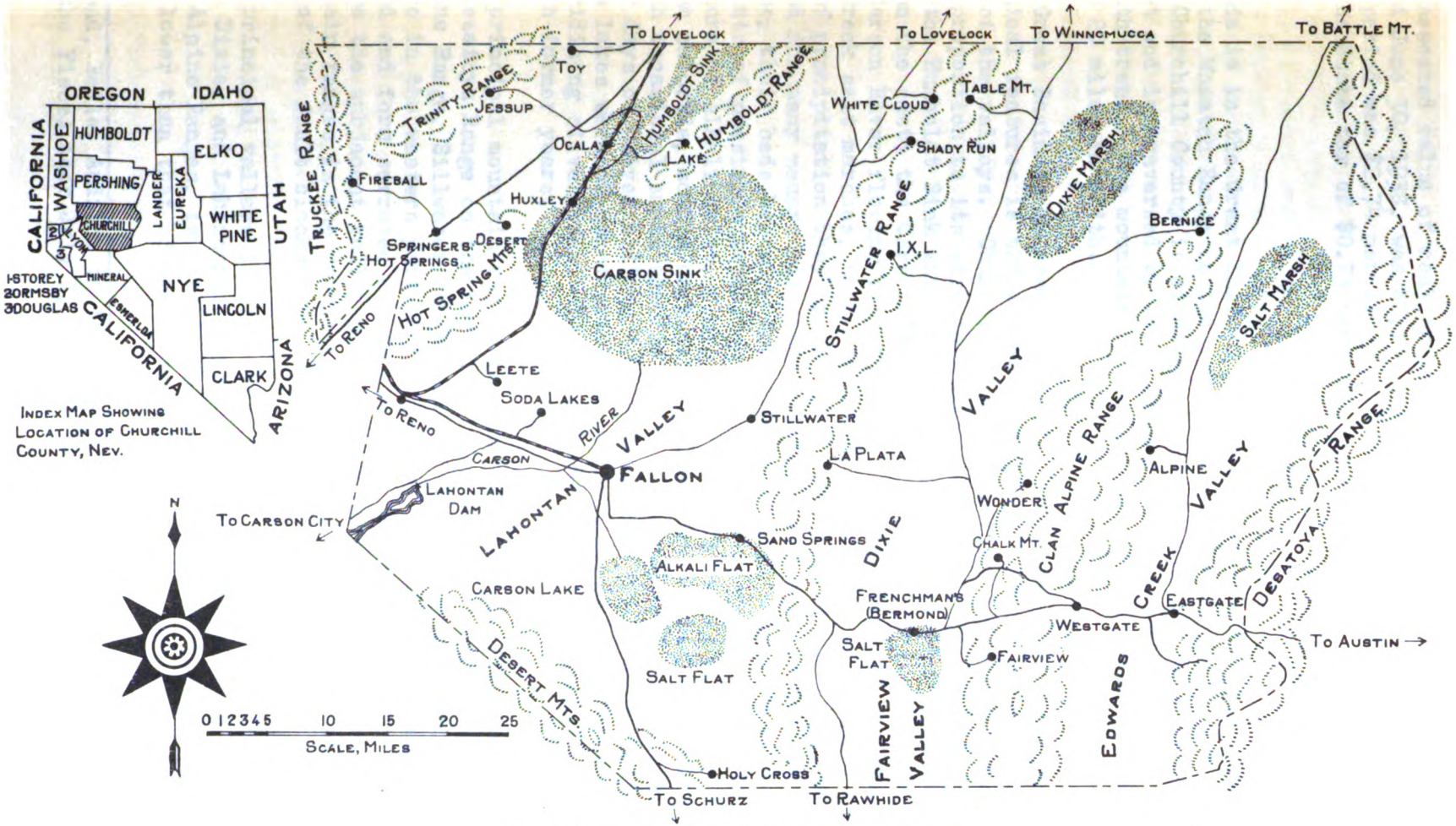

FIGURE 1.—SKETCH MAP OF CHURCHILL COUNTY, NEV.

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The assessed value of real property in the county for the fiscal ear ended June 30, 1938, was $8,108,312, and the county tax rate for ne same period was $2.74 per $100, exclusive of special taxes, but in- luding the State tax of $0.73 per $100 valuation.[4]

Topography

Nevada is in the Great Basin and lies between the Sierra Nevadas on the est and the Wasatch Range on the east. The northern part of the Great Basin, n which Churchill County is situated, has a general altitude of about ,000 feet and is traversed by long, narrow mountain ranges having a general rth-south trend. The mountain ranges are separated by valleys ranging om 5 to 20 miles in width.

The Great Basin is an area of interior drainage; one of its peculiar pographical features is the number of playa lakes that occupy the lowest rtions of the valleys. Churchill County contains a greater number of such kes in proportion to its size than any other county in the State. They mprise the Humboldt Sink which receives the drainage of the Humboldt lver from the east; the Carson Sink, which is the natural drainage basin r the Carson River flowing from the west; and the Dixie Sand Springs and lwards Creek salt marshes, which drain valleys of the same names. During eriods of precipitation they are covered with shallow sheets of water which y extend for many square miles, but during the summer months they evaporate dryness, their beds becoming level mud plains so compact and hard that ne imprints of passing automobiles are barely discernible. The beds consist a mixture of alkali salts, clay, and silt. The salts generally present e sodium chloride, sodium carbonate, sodium bicarbonate, and sulfate of da, with occasional small amounts of potassium chloride and borates. In ne early days of silver milling by the Washoe and Reese River processes, ne playa lakes were of considerable economic importance as a source of salt r chloridizing silver ores. The playas were also important as a source of rates in former years.

The principal mountain ranges in Churchill County, from east to west, e the Desatoya Range on the border between Churchill and Lander Counties, an Alpine Range, Sillwater Range, and Hot Springs Range. Other minor nges are in the western part of the county. The higher ranges generally e rugged and form serrated crests having an altitude of 1,000 to 5,500 et above the subjacent valley plains. The alternate arrangement of valleys d mountain ranges is the result of orographic displacement, the uplifted rtions of the fault blocks appearing as long, narrow ranges.

The principal valleys in the county, from east to west, are Edwards Creek, irview, Dixie, and Lahontan. Dixie Valley, lying between the Stillwater d Clan Alpine Ranges, is unusual in that the floor of the valley is nearly 0 feet lower than that of the other valleys in the county.

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[4] Wickland, Belle, Auditor of the County of Churchill, 22d Annual Report for the Fiscal Year July 1, 1937, to June 30, 1938.

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Water Resources

Two of the largest rivers in Nevada normally discharge into sinks within the borders of Churchill County. The Humboldt River, with its tributaries, constitutes the largest stream system in the State; it rises in the northeastern corner of Nevada and, after flowing in a general west-southwest direction for at least 400 miles, finally empties into Humboldt Sink, part of which is in northern Churchill County. In 1935 the Federal Government constructed the Rye Patch Dam northwest of Lovelock to impound the waters of the Humboldt River; the entire flow is used for irrigation in the valley south of Lovelock, so that no waters reach Humboldt Sink.

The Carson River rises on the eastern slope of the Sierra Nevadas in California and flows northerly and easterly, entering Nevada as two separate streams known as East Fork and West Fork, which unite a few miles from the State line to form the main river. The Carson River normally empties into Carson Sink, but its waters are impounded in Lahontan Reservoir, which supplies the Newlands reclamation project, the first Federal irrigation project in the west. The water is used to generate hydroelectric power and irrigate farm lands in the vicinity of Fallon.

The Stillwater and Alpine Ranges are traversed by V-shaped canyons in which flow small mountain streams, several of which are perennial. Artesian water is present in Dixie and Edwards Creek Valleys. Hot springs occur in Dixie Valley on the west side of Dixie Salt Marsh and at Hot Springs station on the west side of Hot Springs Mountains.

The valleys between the mountain ranges are the natural underground drainage receptacles for the run-off, so that, if not otherwise available, water for mining and milling purposes can be developed by sinking wells, usually within convenient distance of most of the districts mentioned in this report.

Climate and Vegetation

The amount of precipitation in Churchill County varies progressively with the altitude, the mountains receiving the most and the valleys the least. Data compiled by the Nevada Agricultural Experiement Station indicate that approximately 46 percent of the area has an annual precipitation of 0 to 5 inches, 27 percent, 5 to 8 inches; 24 percent, 8 to 15 inches; and the remaining 3 percent, comprising the higher mountain ranges in the eastern part of the county, 15 to 20 inches. The precipitation is largely in the form of snow. With the exception of some of the more isolated areas within the county that may be snowed in for brief periods, all parts of the county are accessible the year around.

The climate is moderate and healthful and marked especially during the summer months by a large diurnal range in temperature, warm days being followed by cool nights. During the summer the days are warm, and there is an abundance of sunshine. The seasons are not distinct, and the transition

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om one to the other is almost imperceptible. In the spring and fall, winds se with considerable regularity each day and form whirlwinds, which, on the y lakes, whirl clouds of sand and alkali dust high into the air, often to eight of 1,000 feet.

Sagebrush, which grows throughout the county except on the higher mountain opes above a general altitude of 6,500 feet is the dominant plant growth in e county. The saline marshes are sterile except for sparse growth of salt-ving plants, such as salt grass and tule, along their borders. The sagebrush nds are generally arable as they contain all the minerals necessary for ising crops adapted to the temperate zone. The larger portion of such land wever, is unproductive, as rainfall is insufficient to support cultivated ops. Where water for irrigation is available, good crops are raised. The rtility of the soil is indicated by the size and thriftiness of the sage-ush, high growths indicating a rich soil containing more than the ordinary ount of moisture. The tenumbi bush (so-called by the Indians) is abundant Dixie Valley and appears to be associated with shallow ground water, to ich the roots penetrate to obtain moisture.

On the mountains above an altitude of about 7,000 feet the greater ecipitation favors sparse growths, such as dwarfed juniper (Junipero cidentalis), mountain mahogany (Cerocarpus laediforius), and piñon pine inus monophylla) being the most common. The forest growths are suitable ly for firewood.

White sage, bunch grass, and other varieties of nutritious grasses rnish forage for cattle and sheep.

Power Facilities

The only public service power company operating in Churchill County is the Truckee-Carson irrigation district, which serves Wadsworth and Nixon Washoe County, Fernley and Fallon in Churchill County, and the surrounding ral populations from the Lahontan hydroelectric plant 17 miles west of llon. The plant has a capacity of 1,500 kilowatts supplied by three hydro-ctric generators; the current is distributed through 283 miles of trans-sion and distribution lines at 33,000, 11,950, and 6,900 volts. None of mining districts mentioned in this report is served by the district. er for mining and milling is supplied by internal-combustion engines.

Transportation Facilities

The main line of the Southern Pacific R. R. traverses the northeast tion of Churchill County, and a branch line 16 miles in length connects en on the main line with Fallon, the county seat.

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The freight rates on ore and concentrates per ton from Fallon, the principal shipping point within the county, to Utah smelters are as follows:5/

Value per ton	$15	$20	$30	$40	$50	$60	$70
40-ton minimum	3.30	3.30	4.00	4.70	5.40	6.10	6.80
20-ton minimum	5.20	6.00	6.50	7.00	7.70	8.20	8.70

Value per ton	$80	$90	$100	$150	$200	$250	$300
40-ton minimum	7.50	8.20	8.90	-	-	-	-
20-ton minimum	9.20	9.70	10.20	11.50	12.20	14.30	14.30

Fallon is also on U. S. Route 50, (Lincoln Highway) which passes through the county in a northwest-southeast direction. U. S. Route 40 (Victor Highway) cuts across the northwestern part of the county. Both of these roads are hard-surfaced. Unimproved branch roads connect with the main highways at various points, so that virtually all of the districts mentioned in this report are accessible by automobile.

History of Mining

Churchill County was inhabited by Indians long before the appearance of the white men, but there is virtually no evidence to indicate that the aborigines were versed in the art of mining. Vestiges of prehistoric Indian occupation are found in the form of petroglyphs chiseled in caves and on ledges in several localities and in articles of Indian workmanship found in several caves in the northern part of the county. The mysterious petroglyphs were chiseled by people who have left no decipherable records of their origin or state of civilization. Some of these rock inscriptions are found west of the Fallon Schurz highway, 12 miles southwest of Fallon, along terraces left by the receding water of ancient Lake Lahontan, which at one time covered an area of about 8,000 square miles.

In the northern part of Churchill County are several limestone caves that were used as dwellings by Indians. The largest of these caves, situated 22 miles southwest of Lovelock, was located as a mining claim in 1911 by James H. Hart and David Pugh, of Lovelock, Nev., for the bat guano found therein. During the removal of about 250 tons of guano for fertilizer, numerous Indian artifacts were found, and subsequently the cave was explored by archeologists. Harrington6/ states it is probable that articles found in the debris range in age from 1,000 B. C. to recent time. It is interesting to note that of about 10,000 specimens of ancient Indian civilization unearthed in the cave, no metals were found.

The mining history of Nevada can be divided into two periods of extraordinary activity. The first began in the sixties with the discovery of the

5/ Since the foregoing table was prepared, there has been an increase in freight rates and 10 percent of the foregoing rates must be added.

6/ Land, Llewellyn L., and Harrington, M. R., Lovelock Cave: University of California Publication in American Archeology and Ethnology, Vol. 25, No. University of California Press, Berkeley, California, 1929, pp. 119-120.

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omstock lode and continued until about 1885; the second period began with he discovery of Tonopah at the beginning of this century and continued for bout 3 decades.

Although Churchill County was traversed by the two main pioneer overland ravel routes across the State taken by emigrants to California in the gold ush of '49 and the years following, no metal was discovered until the early ixties. Humboldt and Carson Sinks, in the western part of the county, known o the pioneers as the Forty-Mile Desert, constituted one of the most formid- ble barriers to early-day travel, and the country appeared so forbidding that here was little to induce them to tarry or to invite their return.

The first recorded mineral discovery in the county was made by Asa L. Kenyon n 1855, when soda was found in the Soda Lakes near Ragtown. Kenyon, the first ettler in the county, established a trading post at Ragtown in 1854. Ragtown afterward called Leeteville) is one of the historical sites in Nevada, since t was here that the emigrants recruited their stocks and rested after cross- ng Humboldt and Carson Sinks. It was a station on both the Humboldt River oute and the Simpson route; the latter route, laid out by Capt. (later Col.) . H. Simpson for the United States Government in 1859, was used by the ony express and later by the Overland Mail & Stage Co., and was the principal ine of travel across the State until the completion of the Central Pacific R. R. ow Southern Pacific R. R.) in 1869. This route went by way of La Plata, ew Pass, Jacobsville, and a point near Austin, coming within a few miles of he two most important mineral discoveries in Churchill County - Fairview and onder; but, notwithstanding this fact, the mining camps at these places were ot established until nearly half a century later. Although Churchill County as overrun by prospectors in the sixties, no important mineral discoveries ere made until many years later.

The status of the metal-mining industry in Churchill County in the late ixties is given in the following extract from a Government report by Browne nd Taylor.[1]

In Churchill County there are three districts that have attracted some otice, because of the supposed valuable ledges they contained. These are verally named the Silver Hill, the Mountain Well (La Plata), and the lan Alpine, and to them most of the work performed in the county has been onfined. There are in this county four quartz mills carrying 55 stamps, and aving driving power equal to that of 165 horses. The total cost of these ills was $395,000. Three of them are at Mountain Well, and one not quite inished in the Clan Alpine district. They have produced but a few thousand ollars' worth of bullion all told, none of them having been able to run for ore than a few days at a time, from an insufficient supply of pay ore, but ew of the ledges here having been opened up to even the superficial depths ommon to most other districts. In the higher strata of some of them small

[1] Browne, J. Ross, and Taylor, James W., Reports Upon the Mineral Resources of the United States: Gov. Printing Office, 1867, p. 128.

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aggregations of very rich ores have been found, and the chances favor the supposition that when properly developed they will afford enough ore to keep the present and perhaps additional mills running. Very few additional mills, however, can be operated in the western half of the county, owing to the limited supply of wood and water.

The production of salt from the dry lakes in Churchill County attained considerable importance in the sixties and seventies. The salt was largely used in reducing silver ores on the Comstock and other silver camps in the northern part of the State.

With the discovery of Tonopah in Nye and Esmeralda Counties in 1901 a revival of mining took place. All parts of the State were overrun by prospectors; and, as a result, a number of gold and silver deposits were found and new camps established. Churchill County was not overlooked, and during this period the deposits at Fairview (1905), Wonder (1906), and several others of less importance were found and worked. During this period speculation in mining was prevalent, and an abundance of money was available for mining ventures; miners obtained valuable leases and money for equipment and development with little difficulty; claim owners were able to sell their holdings for cash with few or no showings. One of the striking developments in mining activity during the period was the widespread application of the leasing system whereby a claim or portion of a claim is worked upon payment of a royalty or certain percentage of the value of the ore produced. To the leasing system may be attributed the discovery of many camps in the State, including Fairview and Wonder.

After 1920, with exhaustion of the ore reserves at Wonder and Fairview, mining declined, so that for a number of years the only activity has been a small amount of desultory leasing operations or small company operations, the latter generally short-lived.

In the first part of 1939 the writer estimated that 50 men, mostly lessees were employed directly in the mining industry in Churchill County.

Mineral Production

Statistics on mineral production of Churchill County before 1903 are incomplete. The net annual production of gold and silver from 1885 to 1903, as compiled from the reports of Churchill County assessors, is shown in table 1. The figures in the table are based on the value of the ore after mining and milling expenses were deducted. The gross production for the period stated is estimated to have been about $250,000. From fragmentary data, the production of metals before 1885 is estimated to have been an additional $50,000, making a total of $300,000 up to 1903. This production was derived from a number of small properties in widely scattered districts.

8/ Stewart, E. E., Nevada's Mineral Resources: State Printing Office, Carson City, Nev., 1909, p. 110.

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With the discovery of the camps of Fairview and Wonder in 1905 and 906, respectively, metal production increased considerably. From 1904 to 1937 ne metal mined, chiefly silver and gold, had a total value of $10,330,698, s shown in table 2.

TABLE 1.- Net annual production of gold and silver from Churchill County, 1885-1903

(Compiled from quarterly assessment rolls of the county assessors)

Year	Gold and Silver	
	Tons	Values
1885	1,521	$57,380
1886		
1887	243	14,096
1888		
1889	200	12,000

Year	Value of gold	Value of silver	Total value
1890	$ 4,000	$ 6,000	10,000
1891	3,000	5,000	8,000
1892	2,000	2,000	4,000
1893	2,000	2,000	4,000
1894	(1/)		
1895	2,000	5,000	7,000
1896	2,500	4,500	7,000
1897	1,500	4,000	5,500
1898	1,500	4,000	5,500
1899	1,800	4,500	6,300
1900	(1/)		
1901	2,000	3,000	5,000
1902	5,000	8,000	13,000
1903	5,000	8,145	13,145
Total	32,300	56,145	171,921

1/ No figures given.

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TABLE 2.- Gold, silver, copper, and lead production in Churchill County, Nev., 1904-37, in terms of recovered metal
(Compiled by Charles White Merrill, Mineral Production and Economics Division, Bureau of Mines)

Year	Placer					
	No. of mines	Gold		Silver		Total Value
		Fine ounces	Value	Fine ounces	Value	
1904.....	-	-	-	-	-	-
1905-06....	-	-	-	-	-	-
1907.....	1	-	-	-	-	-
1908.....	-	-	-	-	-	-
1909.....	-	-	-	-	-	-
1910.....	-	-	-	-	-	-
1911.....	-	-	-	-	-	-
1912.....	-	-	-	-	-	-
1913.....	-	-	-	-	-	-
1914.....	-	-	-	-	-	-
1915.....	-	-	-	-	-	-
1916.....	-	-	-	-	-	-
1917.....	-	-	-	-	-	-
1918.....	-	-	-	-	-	-
1919.....	-	-	-	-	-	-
1920.....	-	-	-	-	-	-
1921.....	-	-	-	-	-	-
1922.....	-	-	-	-	-	-
1923.....	-	12.24	$253	3	$2	255
1924.....	-	-	-	-	-	-
1925.....	-	-	-	-	-	-
1926.....	-	-	-	-	-	-
1927.....	-	-	-	-	-	-
1928.....	-	-	-	-	-	-
1929.....	-	-	-	-	-	-
1930.....	-	-	-	-	-	-
1931.....	-	-	-	-	-	-
1932.....	-	-	-	-	-	-
1933.....	-	-	-	-	-	-
1934.....	-	-	-	-	-	-
1935.....	-	-	-	-	-	-
1936.....	-	-	-	-	-	-
1937.....	-	-	-	-	-	-
Total....	1	12.24	$253	3	$2	255

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TABLE 2.- Gold, silver, copper, and lead production in Churchill County, Nev., 1904-37, in terms of recovered metal (cont'd.)
(Compiled by Charles White Merrill, Mineral Production and Economics Division, Bureau of Mines)

	Lode							
	No. of mines	Ore	Gold		Silver		Copper	
		Short tons	Fine ounces	Value	Fine ounces	Value	Pounds	Value
.....	3	460	306.72	$6,340	-	-	-	-
-06.	-	-	-	-	-	-	-	-
.....	6	7,316	7,371.38	152,380	655,480	$432,617	-	-
.....	16	2,090	2,656.76	54,920	265,425	140,675	5,212	$688
.....	8	1,211	1,723.74	35,633	140,204	72,906	-	-
.....	15	1,164	2,083.13	43,062	162,541	87,772	2,417	307
.....	14	19,463	5,998.02	123,990	456,066	241,715	-	-
.....	10	58,434	17,325.70	358,154	1,434,068	881,952	6,196	1,022
.....	12	83,901	15,630.15	323,104	1,383,257	835,487	4,292	665
.....	19	114,771	15,435.16	319,073	1,545,926	854,897	3,892	518
.....	13	123,991	13,866.40	286,644	1,620,573	821,630	19,167	3,354
.....	20	110,943	13,734.15	283,910	1,386,524	912,333	9,609	2,364
.....	13	60,587	8,408.35	173,816	887,765	731,518	4,030	1,100
.....	13	49,950	4,970.09	102,741	625,152	625,152	1,435	354
.....	12	40,892	5,816.13	120,230	488,053	546,619	-	-
.....	9	1,292	534.54	11,050	26,686	29,088	-	-
.....	9	70	32.60	674	3,837	3,837	194	25
.....	8	2,269	106.38	2,199	40,971	40,971	13	2
.....	11	1,104	114.74	2,372	30,601	25,093	174	26
.....	10	101	13.55	280	5,157	3,455	129	17
.....	9	1,445	123.45	2,552	67,204	46,640	1,914	272
.....	8	896	210.43	4,350	27,490	17,154	1,453	203
.....	7	368	60.37	1,248	7,078	4,013	443	58
.....	4	625	138.35	2,860	4,687	2,742	1,112	160
.....	3	976	13.96	289	3,147	1,677	498	88
.....	3	1,047	39.09	808	3,327	1,281	55	7
.....	4	417	245.45	5,074	13,396	3,885	-	-
.....	5	225	43.85	906	748	211	-	-
.....	6	78	47.09	973	1,677	587	-	-
.....	17	2,545	1,728.16	60,399	12,124	7,838	1,596	128
.....	19	5,378	1,926.25	67,419	33,348	23,969	372	31
.....	26	4,173	1,937.00	67,795	60,792	47,083	-	-
.....	15	2,738	896.00	31,360	61,419	47,508	-	-
tal.	-	700,920	123,537.14	2,646,605	11,454,723	7,492,305	64,203	11,389

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TABLE 2.- Gold, silver, copper, and lead production in Churchhill County, Nev., 1904-37, in terms of recovered metal (cont
(Compiled by Charles White Merrill, Mineral Production and Economics Division, Bureau of Mines)

Year	Lode				
	Lead		Total Value	Average recoverable value of ore 1/	Total Va (lode an placer)
	Pounds	Value			
1904....	-	-	$6,340	$13.78	$6,3
1905-06.	-	-	-	-	
1907....	-	-	584,997	79.96	584,99
1908....	1,690	$71	196,354	93.95	196,3
1909....	26,602	1,144	109,683	90.57	109,6
1910....	31,602	1,390	132,531	113.86	132,5
1911....	117	5	365,710	18.79	365,7
1912....	6,538	294	1,241,422	21.24	1,241,4
1913....	162	7	1,159,263	13.82	1,159,2
1914....	10,518	410	1,174,898	10.24	1,174,8
1915....	24,574	1,155	1,112,783	8.97	1,112,7
1916....	8,902	614	1,199,221	10.81	1,199,2
1917....	33,951	2,920	909,354	15.01	909,3
1918....	39,090	2,775	731,022	14.64	731,0
1919....	22,932	1,215	668,064	16.34	668,0
1920....	12,659	1,013	41,151	31.85	41,1
1921....	38,393	1,728	6,264	89.49	6,2
1922....	545	30	43,202	19.04	43,2
1923....	82,802	5,796	33,287	30.15	33,5
1924....	37,803	3,024	6,776	67.09	6,
1925....	919,626	80,007	129,471	89.60	129,
1926....	447,788	35,823	57,530	64.21	57,
1927....	142,859	9,000	14,319	38.91	14,
1928....	219,156	12,711	18,473	29.56	18,
1929....	140,315	8,840	10,894	11.16	10,
1930....	30,348	1,517	3,613	3.45	3,
1931....	200	7	8,966	21.50	8,
1932....	-	-	1,117	4.96	1,
1933....	8,820	326	1,886	24.18	1,
1934....	152,232	5,633	73,998	29.08	73,
1935....	7,233	289	91,708	17.05	91,
1936....	6,000	276	115,154	27.60	115,
1937....	36,000	2,124	80,992	29.58	80,
Total	2,489,457	180,144	10,330,443	14.74	10,330,

1/ Not to be confused with average assay value of ore.

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Small amounts of nickel, antimony, and tungsten ores also have been duced. In the industrial-mineral group considerable quantities of salt, bably about 500,000 tons, have been mined, chiefly for metallurgical use. ween 1870 and 1873 borax was produced from the salines in Sand Springs sh, Dixie Marsh, and Soda Lakes. Although no statistics are available as the amount produced, it has probably been less than 1,000 tons. The pro- tion of sodium carbonate from Soda Lakes between 1868 and 1893 averaged ut 400 tons annually, making a production of about 10,000 tons for the iod. In addition, small amounts of diatomaceous earth and shell limestone e been mined in the county in former years.

Current mining activity is confined mainly to leasing, and the produc- n of shipping ore for the past 2 years has averaged about 300 tons per th.

ALPINE DISTRICT

The Alpine district is in eastern Churchill County on the east side of Alpine Range, about 13 miles northwest of Eastgate. It can be reached automobile from Eastgate over a fair desert road through Edwards Creek ley. The district was originally organized as the Clan Alpine district January 1864 but is now generally known as Alpine. In 1864 a number of ims were located for silver in the vicinity of Florence Canyon, and con- erable work was done on them. In 1866 the Silver Lode Mining Co. erected 0-stamp mill at the mouth of Cherry Creek, where the camp of Alpine was d out. A number of stone buildings, now in ruins, attest this early ivity. The veins proved to be narrow and low-grade, so that the district abandoned after several years. Except for sporadic prospecting, there been little mining since the early days. In all probability not more n a few thousand dollars has been produced. In April 1939 the only mining this area was on the Nevada Gold group of claims.

Nevada Gold Group

The Nevada Gold group, comprising three unpatented claims owned by Spring of Fallon, is at the head of Stone Canyon, 33 miles by road th of Eastgate. This property was prospected in the early days, but re is no record of any production. From the size of several small stopes, ever, production probably has been several hundred tons of shipping ore. ly in 1939, Spring, working single-handed, mined about 50 tons of shipping .

Development consists of a crosscut adit 500 feet long that is filled- h detrital material washed in by cloudbursts. A second adit has been ven on the vein for about 100 feet. These workings, with several scattered n-cuts and a shaft 130 feet deep, total approximately 800 feet. The only ipment on the property consists of tools for hand-mining and several camp ldings. There is a small perennial stream in Stone Canyon that probably ld furnish enough water for a small mill.

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The formation is slate intruded by monzonite. The ore occurs in two nearly parallel fissure veins traversing both the slate and monzonite. The vein on which most of the work has been done strikes N. 10° E. and dips 50° westerly. The economic minerals are silver, gold tetrahedrite, galena, and sphalerite and their oxidation products in a gangue composed chiefly of quartz with a little pyrite. Width of veins ranges from a few inches to 5 feet, and where the ore has been stoped the veins average about 2 feet in width.

BERNICE DISTRICT

The Bernice district is on the west slope of Clan Alpine Range in east Churchill County, 90 miles by road, a little south of west from Fallon and 70 miles southeast of Lovelock, both towns being on the Southern Pacific R. R. From Fallon the district can be reached by automobile over the Lincoln Highway to Dixie Valley turn off, a distance of about 40 miles, and thence up Dixie Valley to the mines situated in Bernice and Hoyt Canyons. The last 25 miles of road is in poor condition, but with careful driving is passable.

Silver and antimony ores were discovered in the district in the late eighties. The principal ore mined has been silver ore from the Williams mine; probably about 500 tons of antimony ore has been shipped. In 1939 the only activity in this area was by lessees on the Bluebird group of claims.

Silver Deposits

The Williams mine at the head of Bernice Canyon comprises two patented and three unpatented claims owned by the Warren W. Williams estate. This property was discovered by James Wardell in the late seventies and was sold to Williams, who operated it from 1880 to 1890. A 10-stamp mill was erected below the mine in Bernice Canyon; silver produced is said to have amounted to $300,000. The ores contained considerable arsenic in the form of arsenopyrite and the mill was equipped with two White-Howell roasters. The ore is in a series of narrow veins in shale. The outcrops carried considerable antimony, which decreased at depth. The mine has been inactive for many years.

The tailings pile below the old mill site, containing about 6,000 tons, is owned by C. M. Beeghly and L. T. Ellis, according to a location notice dated March 18, 1939.

The Bluebird group, comprising six unpatented claims owned by Albert Lofthouse, of Fallon, is in the northern part of the district. In 1939 the property was under lease to D. G. Brunner, A. J. Cooley, and associa- who, up to April 1939, had made one small shipment of ore to the McGill smelt- Here the ore occurs in a narrow vein in limestone.

Antimony Deposits

Antimony was first discovered in the district in the eighties by H. Hoyt, W. W. van Reed shipped several cars of hand-sorted ore containing 62 percent antimony to the Star and Matthews smelter in San Francisco. A small quantity

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antimony ore was produced in 1893 by Sanders and Young, and the last oduction of record was made in 1906, when 200 tons were shipped. Solomon, Jr., of San Francisco, identified with the Chapman Smelting Co., s active in the district during the World War. Although considerable velopment work was done at that time there is no record of any production.

The Antimony King and Lofthouse mines are the principal antimony operties. The former is at Bernice and the latter about 5 miles southwest. e deposits have been prospected by numerous superficial workings. According Mallory,[2] the prevailing geological formations are a series of sedimentary cks, chiefly slate, shale, and limestone intruded by granite. The commercial timony ore occurs in quartz veins in the lower slate stratum of the sedimentary ries closely associated with limestone strata. At the Antimony King mine are o siliceous limestone beds averaging about 2 feet in thickness and being 300 et apart. The most persistent bed is traceable on the surface for 3 miles. e croppings of limestone are stained yellow from antimony oxide along the leavage planes, but it is not present in commercial quantities.

The Antimony King vein is traceable on the surface for 900 feet and strikes 10° E. with a dip of 50° W. It cuts the slate and limestone strata at nearly ght angles. The width of the vein ranges from 4 inches to 4 feet, and both lls have a parting of black slaty gouge. The vein filling is predominantly artz containing shoots of nearly solid antimony in places. The weathered ne contains cervantite, the yellow oxide of antimony, which in places forms atings on stibnite. Sphalerite occurs sparingly. The best ore is near the tersection of the vein with the southern limestone stratum.

The Lofthouse vein parallels the Antimony King vein; the best ore likewise curs associated with a limestone stratum in the enclosing shale. In the fthouse vein the antimony is less massive, occurring in fibrous or needle-e forms.

CHALK MOUNTAIN DISTRICT

The Chalk Mountain district is in the southeastern part of Churchill County the vicinity of Chalk Mountain in the southern end of Dixie Valley. This untain, isolated from the main Alpine Range, is 3 miles long and 2 miles de and rises to a height of about 1,000 feet above the surrounding terrain. is composed of whitish dolomitic limestone, which forms a conspicuous land-rk in the region. The nearest railroad connection is at Fallon, 44 miles t-northwest of the principal mine. The district is midway between Wonder and irview, sometimes being considered part of the latter, which lies about 8 miles uth. The mineral production is included under the Fairview district.

Chalk Mountain was prospected in the early years of mining activity in urchill County, but received little attention until 1923, when E. M. Dawes terested a Minneapolis group and acquired control of the Chalk Mountain Silver

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[2] Mallory, Willard, Antimony Veins at Bernice, Nev.: Min. and Sci. Press, Vol. 112, 1916, p. 556.

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Lead Mines Co. Dawes and associates started a development campaign and several deposits of ore were found. This development and increased production stimulated activity, and about eight small companies were organized, which were active during 1925 and 1926. These small companies produced little, and all became inactive after short periods of prospecting. In the early part of 1939 the only mining activity was by lessees on the property of the Chalk Mountain Silver Lead Mines Company.

Production of the district has totaled several hundred thousand dollars in shipping ore, virtually all of which was produced by the Chalk Mountain Silver Lead Mines Co.

Chalk Mountain Silver Lead Mines Co.

The Chalk Mountain Silver Lead Mines Co., E. M. Dawes, Lovelock, Nev., president, owns 12 unpatented claims on the east slope of Chalk Mountain. The company was incorporated in 1920 under the laws of Nevada, with a capitalization of 2,000,000 shares at a par value of 50 cents, which was later increased to $1 per share. The principal production was made between 1923 and 1929. In 1925, 1,505 tons of ore sold to a smelter had a value of $86,923 and contained 99 ounces of gold, 59,651 ounces of silver, and 861,355 pounds of lead. Up to June 1, 1927, the total production of the company amounted to 2,300 tons valued at $135,000, or an average net value of $58.70 per ton. Some ore was also shipped in 1928 and 1929. In 1929 a 50-ton mill employing table concentration and having a Diesel power plant was erected at the mine to treat the lower-grade ore, but it was unsuccessful metallurgically. In 1930 the company sold the mill equipment and suspended operations, since which time the mine has been operated sporadically by lessees with occasional small shipments. In 1939 the mine was under lease to Harry Howard and associates, who were shipping ore intermittently to the smelter. The royalty payments made by lessees on net smelter returns are 10 percent of the gross smelter value of ore assaying $35 or less, 20 percent on ore ranging between $35 and $75 per ton, and 25 percent on ore having a gross smelter value of more than $75 per ton.

The mine is developed by a 40-foot shaft, two 110-foot shafts, and one double-compartment vertical shaft 517 feet deep, with lateral work on 6 levels. Total workings comprise about 5,000 feet.

Equipment includes a 40-horsepower Fairbanks-Morse gasoline hoist, blacksmith shop, tools for hand mining, and camp accommodations for a crew of about 20 men.

Formation is dolomitic limestone intruded by granodiorite. The limestone is locally folded and traversed by a number of faults, with which the ore bodies are associated. Ore occurs as irregular replacement deposits ranging from 1 to 12 feet in width along fissures and bedding planes of the limestone. The ore minerals are cerussite, anglesite, cerargyrite, wulfenite, vanadinite, and argentiferous galena in a porous gangue consisting of quartz, calcite, altered limestone, and iron oxides. Ore is largely oxidized to the lowest level of the mine, and the high iron content makes it desirable for fluxing.

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The mine dump, consisting of about 3,000 tons, is reported to be ore f milling grade.

DESERT DISTRICT

The Desert district is in the northeast portion of the Hot Springs ountains in northwestern Churchill County on the northeast flank of esert Peak, which has an altitude of 5,401 feet above sea level. Parran iding, on the Southern Pacific R. R., is 7 miles east. The district is ccessible by automobile over a desert road 5 miles in length, which leaves ne Victory Highway at a point several miles northeast of Springer's Hot prings.

The principal mine, the Desert Queen, is said to have been discovered y emigrants in 1849. If this is true, it has the distinction of being the irst lode mine worked in the northern part of Nevada. In the early sixties ne Desert Queen mine was worked by a company from Schenectady, N. Y., with nich Horace Greeley is reported to have been connected. In 1863, a mill onsisting of two two-stamp batteries was built on the flat 2 miles east of ne mine, but it proved unsuccessful and a second mill was built at the edge f Humboldt Sink 14 miles northeast. Eventually the property reverted to ne Public Domain, and in 1931 a group from Lovelock, Nev., relocated the rincipal claims, which in the following year were taken over under bond and ease by Wilford Dennis and associates, who organized the Manitou Gold Mining Co. 25-ton-capacity amalgamation-concentration mill was erected by the company in 937. Early in 1939 a crew of three men was employed on development.

Manitou Gold Mining Co.

The Manitou Gold Mining Co. controls, under bond and lease, the rysler-Bonanza group of 10 unpatented claims owned by Herman N. Marker nd K. O. Olfers, of Lovelock, Nev.

Development consists of three adits, the longest 750 feet, and several allow shafts and old workings, totaling approximately 4,000 feet. Mining quipment includes an Ingersoll Rand, two-stage compressor (model 25) with a aukesha gasoline engine, a blacksmith shop, rock drills, and other mining ools. Mill equipment consists of a Blake-type crusher size 7 by 9 inches, a traub ball mill, amalgamation plate, and an Overstrom concentrating table. ower is supplied by gasoline engines. Camp buildings can accommodate a crew f 10 men. Water for milling is pumped from a shaft 265 feet deep near the ill site.

Ore occurs in a series of fissure veins with a maximum width of 5 feet n a diorite formation. The principal vein, the Desert Queen, has a strike f N. 60° W. with a dip of 40° NE. The economic minerals, gold and silver, ave a quartz gangue impregnated with iron oxides.

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EASTGATE DISTRICT

The Eastgate district is on the west side of the Desatoya Range in southeastern Churchill County about 50 miles east-southeast of Fallon, the nearest railroad point. No information is available concerning the first mining activity in this area, although it is known that a number of gold and silver properties have been prospected in a desultory manner for at least 40 years. The production of the district is estimated at about $25,000 in shipping ore, most of which was derived from the Gold Ledge group of claims. In the first part of 1939 the only activity was at the Gold Ledge property.

Gold Ledge Group

The Gold Ledge group of unpatented claims, owned by W. H. Schweis, of Reno, Nev., is situated on a mountain spur off the west side of the Desatoya Range about 56 miles east southeast of Fallon, the nearest railroad point. It can be reached by automobile over an unimproved desert road 5 miles in length, which leaves the Lincoln Highway about 1 mile west of Eastgate. The last 2 miles of the road is in a narrow, steep canyon with a number of sharp turns. First locations in this area were made by E. W. Baker in 1906. The Gold Ledge property has been worked intermittently by individuals and small companies. In 1934 the property was operated for a short time by the Monarch Gold Ledge Mining Co., which erected a 50-ton amalgamation-concentration mill several miles northwest of the mine, but it was unsuccessful; the mill equipment was sold in 1939. About $20,000 in shipping ore has been produced.

Development consists of an adit 350 feet in length along the ledge, an inclined shaft 200 feet in depth with levels at 150 and 200 feet below the surface, a vertical shaft 110 feet deep, and other workings, totaling about 1,500 feet. Mining equipment includes a 7 by 6-inch Sullivan air compressor, belt-driven by an automobile engine; a West Coast, 5-horsepower, gasoline geared hoist; rock drills and other mining tools; a blacksmith shop; and camp accommodations for a crew of four men. Although there is no water at the mine, it can be obtained in Eastgate Wash, several miles northwest of the mine. In 1939 the property was being worked by Schweis with a crew of two men. In 1938 he shipped about 100 tons of ore, averaging approximately $30 per ton, to the Dayton custom mill at Silver City, Nev. The truck haul to the Dayton mill, a distance of about 160 miles over hard-surfaced roads, cost $5 per ton and milling was $4 per ton. The shipper was paid for 90 percent of the assay value of the ore.

Ore containing gold and silver occurs in a fault fissure vein striking N. 30° E. and dipping about 65° easterly. The formation is altered rhyolite. The vein ranges in width from 1 to 6 feet, with no well-defined walls. The gangue is composed largely of crushed and iron-stained rhyolite showing little silicification. At the south end of the workings the vein has been intercepted by a number of faults that cut it at right angles; to the north, a fault striking N. and S. and dipping 70° E. apparently has displaced the vein several hundred feet north, as indicated by workings on a vein east of the fault.

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The smelter returns on a shipment of ore made by W. H. Schweis to ternational Smelting Co. at Tooele, Utah, on March 20, 1936, furnished e following data:

Metal quotations:	Gold	$35.00 per ounce.	
	Silver	.77 " "	
	Lead	4.6 cts. per lb.	
		Ounces	
Settlement assay:	Gold	.91	
	Silver	13.44	
		Percent	
	Copper	.07	
	Lead	2.0	
	Zinc	Nil	
	Sulfur	.5	
	Iron	1.8	
	Insoluble	90.2	
	Lime	.7	
		Pounds	
Net weight		107,500	
Moisture 2.64 per cent		2,838	
Dry weight		104,662	52.331 tons

Metal payment:	Lead, 50 percent at $0.01075 per pound.	$	.215
	Silver, 95 percent at $0.77 per ounce.		9.831
	Gold, 91 percent at $35 per ounce.		28.984
	Gross value per ton		39.030
Base treatment charge, per ton $4.00			
Charge, 10 percent of gross metal payment over $25. . . .	1.403		
Treatment charge.	5.403		5.403
Net value per ton			33.627
52.331 tons at $33.627 per ton			$1,759.73
Deductions: Freight, $4.70 per ton			252.62
Net proceeds.			1,507.11

Buffalo Hump Group

The Buffalo Hump group of six unpatented claims, owned by W. H. Schweis is the Desatoya Range about 14 miles by road southeast of Eastgate. It can be ached by automobile over a short road that leaves the Ione Road 10 miles south the Lincoln Highway. The property was discovered by Thomas Wilson and bert North some years ago, and although considerable prospecting has been done, e only production has been several carloads of shipping ore. In the first rt of 1939 the property was inactive.

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Development consists of several adits, the longest 400 feet and subsidiary workings such as drifts crosscuts, and raises, totaling about 1,500 feet. Equipment on the property includes tools for hand-mining, blacksmith shop, and camp accommodations for a crew of several men.

Free gold and a little silver occur in an area said to be about 100 feet wide and 200 feet long in a zone of fractured and altered rhyolite. The rhyolite is considerably kaolinized, but silicification is absent. Insufficien sampling has been done to determine the average gold content or whether the deposit is large enough to warrant operations on a large scale.

The smelter returns on ore shipped from the property by W. H. Schweis to International Smelting & Refining Co. on October 15, 1936, furnished the following data:

Metal quotations	Gold,	$35.00 per ounce
	Silver,	$ .4475 per ounce
		Ounces
Settlement assay:	Gold	0.515
	Silver	5.49
		Percent
	Copper	.85
	Lead	.4
	Zinc	Nil
	Sulfur	.4
	Iron	1.1
	Insoluble	92.2
	Lime	.5
	Pounds	
Net weight	49,410	
Moisture 4.2 percent	2,075	
Dry weight	47,335	23.6675 tons

Metal payment:	Silver, less 1/2 ounce at $0.4475 per ounce.	1/ $ 2.233	
	Gold, 91 percent at $35 per ounce.	16.403	
	Gross value per ton. . . .	18.636	
	Less treatment charge per ton	3.500	
	Net value per ton	15.136	
23.6675 tons at $15.136			$358.23
Deductions:	Freight $3.30 per ton		78.10
	Net proceeds.		280.13

1/ Preliminary settlement for silver.

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Building Stone

A deposit of volcanic tuff quarried locally for building stone occurs miles west of the Eastgate ranch and about 1/2 mile off the Lincoln Highway. e deposit is said to be owned by Mrs. Lucille Downing, of Vincennes, Ind. e material was first quarried in the sixties to supply construction stone for ildings at Alpine and Eastgate, and later for several buildings at Fallon.

The quarry has been opened near the crest of a small hill that rises out 100 feet above the surrounding area. The face of the quarry is 100 et in length and averages 8 feet in height. The tuff is siliceous in aracter with grain size quite uniform for this class of stone. It is ite, weathering to a dull gray, and rather tough, but it is easily cut th an ordinary saw. It hardens a little on exposure, but not enough to ise its compressive strength appreciably.

The rock probably is suitable for building stone when little strength is quired, but because of the distance to consuming centers it is of doubtful lue in competition with other materials.

FAIRVIEW DISTRICT

The Fairview district is in southeast Churchill County 42 miles by road utheast of Fallon, the nearest railroad point and supply center. The incipal mine, the Nevada Hills, is on the west slope of Fairview Peak at elevation about 5,500 feet above sea level.

The first locations in the district were made by F. O. Norton and sociates in 1905. The Nevada Hills mine was located by P. Langsden in nuary 1906. The discovery of rich silver-bearing float and ore in oppings created considerable excitement, and a boom ensued the following ar, which gave the district a temporary population of several thousand. 1907 the town of Fairview, laid out on the flat west of the mines, had population of 1,000 and boasted two hotels, several restaurants, stores, d two newspapers. Daily stages and telephone lines connected Fairview th Fallon and Wonder, the latter being 18 miles north. During the first ars of the camp's history, mining was in the hands of lessees and numerous ld-cat companies, most of the latter being very short lived. Until 1911, l the ores produced were shipped to smelters for reduction, and in con- quence only the higher-grade ores were mined. The freight rate on ore om Fairview to Fallon in 1907 was $12.50 per ton. In 1910 the Nevada lls Mining Co., incorporated in 1906, acquired control of the Fairview gle Mines Co., a contiguous property, and the following year the company nstructed a 20-stamp mill employing gravity concentration and cyanidation. ectric power was brought into the camp, and water for milling was obtained om wells in Westgate Wash, about 8 miles northeast of the mine. In 1917, ter a profitable career, the Nevada Hills property closed because of pletion of the ore reserves. Production of the company from September 1911 June 1917 is reported to have been $2,265,000. After the property closed, e electric power line and the water line were removed, and the mill was smantled. Since the Nevada Hills Mining Co. ceased operations, attempts

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have been made by several companies to revive the mine, the most recent of which has been that of the Nevada Range Mines Co., Inc., the present owners.

In April 1939 activity in the district was confined to small leasing operations in the Nevada Hills property. Most of the patented claims in the district have been taken over by the county for nonpayment of taxes.

Production in the district from 1906 to 1937 was 287,040 tons of ore with a value of $4,171,035, an average of $14.53 per ton. Most of this was produced by the Nevada Hills mine. The annual production of the district is shown in table 3.

Nevada Range Mines Co., Inc.

The Nevada Range Mines Co., Inc., controlled by Reno interests, comprises 10 patented claims. The property includes the Nevada Hills mine, which has been the principal producer in the district.

The property is developed by shafts to a depth of 1,000 feet. The underground workings total about 9 miles. Equipment includes a Diesel-engine power plant, blacksmith shop, compressor, partly dismantled 25-ton cyanide mill, and a number of camp buildings.

According to Greenan,[10] the prevailing rocks are dacite tuff, earlier and later andesite, and rhyolite. Strong fissuring has occurred in the earlier andesite, and along these fissure zones are prominent outcrops. The strongest mineral-bearing fissures strike northwest-southeast and dip south. The most productive vein, the Nevada Hills, ranges in width from 1 to 15 feet. The ore minerals are argentite, stephanite, ruby silver, horn silver, chalcopyrite, galena, tetrahedrite, sphalerite, silver, and gold in a gangue of quartz, calcite, and partly replaced andesite with minor amounts of pyrolusite and rhodochrosite. The average proportion of silver to gold by weight is 100 to 1; as the grade of the ore increases, this proportion decreases.

The Eagle vein, second in importance, roughly parallels the Nevada Hills and averages about 16 feet in width, the richest ore being close to the walls. Other parallel veins of less importance are the Dromedary, Wingfield, and Eagles's Nest.

The vein system is cut by a number of transverse faults having a general northeast-southwest trend and dipping 50° to 75° easterly or westerly. The "Big" fault, a great easterly dipping fault, strikes at right angles to the vein system. Outcrops of the veins west of this fault are prominent, but to the east the country is covered by a later flow of andesite, so that it is impossible to determine from surface observations in what direction the veins are displaced. Segments of the veins have been found on the east or hanging-wall side of the Big fault. Oxidization extends to a depth of about 300 feet.

10/ Greenan, James O., Geology of Fairview, Nev.: Eng. and Min. Jour., Vol. 97, 1914, pp. 791-793.

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TABLE 3.- Gold, silver, copper, and lead production from Fairview district, Churchill County, Nev., 1906-37, in terms of recovered metal
(Compiled by Charles White Merrill, Mineral Production and Economics Division, Bureau of Mines)

Year	Lode					
	No. of mines	Gold			Silver	
		Ore, short tons	Fine ounces	Value	Fine ounces	Value
1906..	1	479	1,548.00	$32,000	191,045	$128,000
1907..	1	6,543	6,884.37	142,313	640,246	422,562
1908..	4	1,521	2,117.42	43,771	183,592	97,304
1909..	5	1,204	1,706.53	35,277	139,858	72,726
1910..	8	1,153	2,058.71	42,557	160,284	86,553
1911..	6	9,597	3,425.94	70,820	283,411	150,208
1912..	7	30,016	9,694.84	200,410	959,391	590,026
1913..	8	41,952	6,092.37	125,940	674,485	407,389
1914..	8	64,588	5,703.53	117,903	623,832	344,979
1915..	6	65,503	3,981.39	82,303	438,651	222,396
1916..	9	52,688	4,475.23	92,511	356,843	234,803
1917..	4	4,702	806.43	16,670	68,818	56,706
1918..	4	54	38.44	795	2,938	2,938
1919..	2	163	104.53	2,161	6,849	7,671
1920..	1	8	7.49	155	641	699
1921..	3	19	1.31	27	313	313
1922..	3	8	25.54	528	1,621	1,621
1923..	2	107	5.29	109	2,608	2,139
1924..	3	70	6.28	130	1,931	1,294
1925..	5	1,401	120.44	2,490	59,880	41,557
1926..	5	783	93.47	1,932	23,569	14,707
1927..	4	337	35.98	744	6,350	3,601
1928..	2	409	12.72	263	1,988	1,163
1929..	2	975	13.59	281	3,132	1,669
1930..	2	47	3.13	65	1,250	481
1931..	-	-	-	-	-	-
1932..	2	20	26.65	551	533	150
1933..	3	28	27.40	700	587	205
1934..	1	1	2.10	73	1	1
1935..	3	169	97.17	3,401	8,216	5,905
1936..	13	962	511.95	17,918	40,094	31,053
1937..	6	1,533	337.00	11,795	28,949	22,392
Totals	-	287,040	49,965.24	1,046,593	4,911,906	2,953,211

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TABLE 3.- Gold, silver, copper, and lead production from Fairview district, Churchill County, Nev., 1906-37, in terms of recovered metal (cont'd)
(Compiled by Charles White Merrill, Mineral Production and Economics Division, Bureau of Mines)

Year	Lode					
	Copper		Lead		Total value	Average recoverable value of ore per ton1/
	Pounds	Value	Pounds	Value		
1906...	-	-	-	-	$160,000	$334.03
1907...	-	-	-	-	564,875	86.33
1908...	-	-	1,690	$71	141,146	92.80
1909...	-	-	26,602	1,144	109,147	90.65
1910...	2,417	$307	31,602	1,390	130,807	113.45
1911...	-	-	117	5	221,033	23.03
1912...	6,196	1,022	6,538	294	791,752	26.38
1913...	4,292	665	162	7	534,001	12.73
1914...	3,892	518	9,214	359	463,759	7.18
1915...	2,351	411	22,168	1,042	306,152	4.67
1916...	2,407	592	106	7	327,913	6.22
1917...	-	-	10,449	899	74,275	15.80
1918...	99	24	29,932	2,125	5,882	108.93
1919...	-	-	20,780	1,101	10,933	67.07
1920...	-	-	-	-	854	106.75
1921...	-	-	16,558	745	1,085	57.11
1922...	-	-	-	-	2,149	268.63
1923...	174	26	80,962	5,667	7,941	74.23
1924...	129	17	32,659	2,613	4,054	57.93
1925...	1,914	272	911,320	79,285	123,604	88.23
1926...	1,453	203	446,036	35,683	52,525	67.08
1927...	443	58	142,859	9,000	13,403	39.71
1928...	1,112	160	219,156	12,711	14,297	34.96
1929...	498	88	140,207	8,833	10,871	11.11
1930...	55	7	30,348	1,517	2,070	44.04
1931...	-	-	-	-	-	
1932...	-	-	-	-	701	35.04
1933...	-	-	-	-	905	32.31
1934...	-	-	-	-	74	74.00
1935...	121	10	4,114	165	9,481	56.11
1936...	-	-	3,954	182	49,153	51.04
1937...	-	-	34,000	2,006	36,193	23.66
Totals	27,553	4,380	2,221,533	166,851	4,171,035	14.55

1/ Not to be confused with average assay value of ore.

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The annual report of the Nevada Hills Mining Co. for 1915 contains the -llowing statements relative to the future outlook of the company's opera--ons:

> The extensive exploration which has been carried on at the 650-foot, the 800-foot, the 900-foot, and the 1,000-foot levels has shown negative results, and roughly may be said to have prospected the ground to twice the depth of any known ore body. Deep development has therefore been stopped and the future production of the mine must, so far as known, come from the shallow workings of the Nevada Hills vein west of the "Big" fault. This remaining ore, occurring in the walls of previously worked stopes, is not measurable, but it is thought to be insufficient to supply the mill at capacity for the coming year.

A shipment of ore from the Nevada Hills vein made by Arnold Dummar, ssee, to the International Smelting & Refining co. on February 16, 1939, rnished the following data:

Metal quotations:	Silver	$0.64125 per oz.
	Gold	35. per oz.
		Oz. per ton
Settlement Assay:	Gold	0.445
	Silver	37.15
		Percent
	Copper	0.07
	Lead	Trace
	Zinc	Nil
	Insoluble	92.4
	Iron	2.3
	Sulfur	Trace
	Lime	Nil

	Pounds
Wet weight:	25,100
Moisture, 2.05 percent	515
Dry weight	24,585 or 12.293 tons

Metal payment:	Silver, 95 percent @ $0.64125 per ounce	$22.631	
	Gold, 91 percent @ $35 per ounce	14.173	
	Gross value per ton	36.804	
	Treatment charge per ton	4.750	
	Net value per ton	32.054	
12.293 tons @ $32.054			$394.04
Deductions:	Sampling	$12.00	
	Hauling	31.38	
	Royalty, 15 percent of $305.10	45.77	
	Freight	45.56	
		134.71	134.71
	Net proceeds		259.33

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Gold Basin Mining Co.

The Gold Basin Mining Co., owned by E. S. Montgomery of Fallon, Nev., consists of five unpatented claims in the Gold Basin section of the Fairview district, several miles east of Fairview Peak and 45 miles southeast of Fallon, the nearest railroad point. The property is accessible over a fair desert road connecting with the Lincoln Highway at Westgate, which is 7 miles S. 20° W. of the mine. The property was discovered about 1924, and although considerable work has been done, the only production has been a few small shipments to the Dayton custom mill at Silver City, Nev.

Development consists of an adit 250 feet long, a winze less than 100 feet deep driven from the adit level, and subsidiary workings comprising in all about 600 feet. There is no equipment on the property except several camp buildings. In April 1939 the property was inactive.

Free gold occurs along a series of fractures having a general strike of N. 30° W. with medium dips N. 60° E. in a quartz latite formation. Along the fractures is a small amount of brecciated and oxidized material that pans well in free gold, probably because of mechanical enrichment from erosion of surface material. The deposits are too small and too far separated to carry the intervening waste rock, so that the outlook for mining any appreciable tonnage of mill ore is not encouraging.

Belle Mountain Mining Co.

The Belle Mountain Mining Co., controlled by W. W. Stockton, comprises the Homestake group of eight unpatented and two patented claims on the north end of Belle Flat, 3-1/2 miles southeast of Fairview Peak and about 9 miles in an airline southwest of Westgate. The road from Westgate to the mine through Gold Basin is impassable, but the property is accessible by car via the Broken Hills road from Westgate, a distance of 30 miles. The altitude is about 6,000 feet.

Although considerable exploring has been done on the claims, there is no record of any production. Workings consist of a main adit with several raises and drifts on the vein, a number of open-cuts, and other workings totaling approximately 1,000 feet. There are three camp buildings on the property, but no mining equipment. In April 1939 the property was inactive.

The vein, consisting of calcite with a little quartz, strikes nearly east and west, with a moderate dip to the south. It is traceable on the surface by open-cuts for a considerable distance and has a maximum width of at least 30 feet. The foot wall is andesite and the hanging wall presumably rhyolite. The economic minerals are gold and silver. The best ore is reported to be along the footwall side of the vein.

Shamrock Group

The Shamrock group of eight unpatented claims, owned by Cyrus Cox of Fallon, Nev., is in a range of low hills 6 miles S. 20° W. from Westgate on the Lincoln Highway and about 2-1/2 miles due east from Fairview Peak. Placer

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ld was discovered on the claims by the present owner in 1936, and the source the gold was traced by panning. The only production has been a small amount free gold that was mortared out of high-grade material by Cox during prospect-g.

Development consists of a vertical shaft 64 feet deep, an adit 300 feet g, and minor workings, totaling about 500 feet. Equipment includes a acksmith shop, a home-made gasoline hoist, tools for hand mining, and commodations for a crew of several men.

Free gold occurs along fractures in altered rhyolite and rhyolite eccia stained with manganese and iron oxides. The most persistent fractures rike northwesterly and dip nearly vertical. Some of the fractures are companied by a gouge ranging from a few inches to over a foot in width.

Westgate Custom Mill

In February 1939 the Westgate Mining & Milling Co., owned by S. Montgomery of Fallon and associates, completed the erection of a -ton-daily-capacity cyanidation mill at Westgate, situated on the Lincoln ghway 46 miles southeasterly from Fallon, Nev. In April 1939 the mill was erating on custom ores, obtained chiefly from the Nevada Wonder mine with aller tonnages from the Nevada Hills mine at Fairview, the Gold Ledge mine the Eastgate district, and other properties within a radius of 50 miles.

The mill is equipped with a 9- by 15-inch Blake-type crusher, a set of - by 12-inch Denver rolls, three Snyder disk samplers, a 4- by 4-foot Eimco ll mill, a Simplex classifier, three 10- by 12-foot redwood airlift agitators, ur 18- by 10-foot redwood thickeners, a 4- by 7-foot 20-leaf clarifier, a rrill-Crowe zinc dust-precipitating unit, and auxiliary cyanidation apparatus. ner equipment includes an assay office, a melting furnace, and camp accommoda-ons for a crew of 10 men. Power for milling is supplied by 2 D-11,000 Cater-llar Diesel engines equipped with electric generators. Water for milling is tained from a well near the millsite.

The custom-milling charge is $4.50 per ton, and payment is based on average extraction of 90 percent of the gold and 85 percent of the silver tained in the ores.

Manganese Deposit

A bedded deposit of manganese covered by a group of unpatented claims, ed by V. S. Baxter of Fallon, occurs several miles south of the old Fairview msite, 38 miles southeast from Fallon. It is covered with detritus to a th of 5 to 30 feet; not enough work has been done to determine its extent. ample of the manganese analyzed by the Nevada State Bureau of Mines showed 2 percent MnO_2, 15.2 percent Fe_2O_3, and 17.9 percent SiO_2.

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FIREBALL DISTRICT

The Fireball district is in a low range of unnamed hills in northwest Churchill County about 10 miles northwest of Springer's Hot Springs on the Victory Highway. It was discovered by Fred Anderson in 1930. For several years after its discovery a number of properties were prospected by claim owners and lessees for shipping ore, but the results were discouraging and only about 20 tons of ore that averaged $30 per ton is reported to have been produced. In recent years the only activity has been a small amount of desultory prospecting.

The largest property in the district is the Fireball group, comprising five unpatented mining claims and 200 acres of patented railroad-grant land owned by E. Opdyke of Wadsworth, Nev. Other claims are owned by C. C. Higgins of Reno, Nev.

The economic minerals are gold and a little silver occurring in quartz stringers in silicified limestone cut by rhyolite and andesite.

HOLY CROSS DISTRICT

The Holy Cross district is in southwestern Churchill County near the Mineral County border. Schurz, a station on the Mina-Hazen branch of the Southern Pacific R. R., is 12 miles southwest, and the town of Fallon is 29 miles north. The district was discovered in 1911 by V. B. Terrell, working under grubstake agreement with Craig Catterson, formerly of Rawhide, Nev. Following the discovery considerable prospecting was done, but no important mineral deposits were discovered. The total production, chiefly by lessees, has been about $40,000 in shipping ore. In the fall of 1939 several lessees were active on claims controlled by the Terrell estate.

A diatomaceous earth deposit south of Fallon and several groups of claims northwest of the Holy Cross district proper are included in the Holy Cross district for convenience.

Terrell Group

A group of 26 claims, comprising the principal workings in the district, is controlled by the Terrell estate, administered by Henry Smith of Fallon, Nev

The workings consist of about 10 shallow shafts and several adits, comprising in all about 3,000 feet of scattered workings. The deepest shaft is 140 feet and the longest adit 1,500 feet. Equipment on the property consists of tools for hand mining and seven camp buildings.

Ore occurs in a series of narrow veins in rhyolite and andesite. The principal metallic minerals are silver chloride, gold, cerussite, a small amount of zinc, and in places some manganese. On the Last Hope claim manganiferous silver veins striking north and south and dipping vertically up to 2 feet in width are traceable on the surface for several thousand feet. The manganese, in the form of psilomelane and pyrolusite, ranges from 5 to 15 perce

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t the deposits are too small and too low-grade to have economic importance r their manganese content. The silver and gold occur largely in the fines, i lessees obtain a high-grade product by screening and hand sorting.

A small shipment of high-grade screened ore mined from the Silver Star aim by E. P. Frankum and shipped to the Selby smelter of the American Smelt- g & Refining Co. at Selby, Calif., on August 27, 1938, furnished the follow- g data:

Metal quotations:	Gold	$35 per ounce
	Silver	.64 1/8 cents per ounce
	Lead	4.90 cents per lb.
		Ounces per ton
Settlement assay:	Gold	1.62
	Silver	449.92
		Percent
	Lead	13.5
	Insoluble	58.8
	Iron	5.4
		Pounds
Gross weight 12 sacks ore		1,185
Tare		14
Wet weight		1,171
Moisture, 1.5 percent		18
Dry weight		1,153

Metal payment:	Gold, @ $31.81663 per ounce		$ 51.54
	Silver, less 5 percent @ $0.64 1/8 per ounce		274.09
	Lead, less 10 percent at 3.4 cents per pound		8.26
	Gross value per ton		333.89
	Smelter charge		10.95
	Net value per ton		322.94
1,153 pounds or 0.5765 ton at $322.94			$186.17
Deductions:			
	Sampling and assaying	$10.00	
	Freight	9.32	
	Parcel post (sacks)	.40	
		19.72	19.72
	Net proceeds		$166.45

Cinnabar Hill Group

The Cinnabar Hill group of six unpatented claims, owned by A. L. Robinson Fallon, is in a range of low hills 38 miles southeast of Fallon. It is cessible by automobile by driving south from Fallon on the Fallon-Schurz ghway to the Camp Terrell turn off, a distance of 25 miles, and thence north- st for about 13 miles, or 6 miles beyond Cushman Well, an old landmark in this

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section. Cinnabar float was found in this area by Robinson in October 1938; its source was discovered by tracing the float up the side of a small hill. As the property is in the prospect stage of development, there has been no production.

Development work includes a 75-foot shaft, a 60-foot adit, and a small amount of drifting and crosscutting, totaling about 175 feet.

The formation is rhyolite and andesite flanked on the west by granite. The cinnabar occurs in a fissure striking N. 70° E. and dipping about 40° NW. Not enough work had been done to determine the extent of the deposit. The cinnabar occurs in a gangue of quartz, kaolin, and decomposed rhyolite stained with iron oxides.

Bimetal Group

The Bimetal group of three unpatented claims, owned by A. L. Robinson of Fallon, lies 1 mile due south of the Cinnabar Hill property. Gold was discovered here by Robinson in 1932. The only production has been several tons of ore averaging about $40 per ton.

Workings comprise four shafts ranging from 10 to 100 feet in depth and several open-cuts. Equipment includes tools for hand mining and camp accommodations for two men.

Free gold alloyed with a little silver occurs in a quartz vein in granite. The vein strikes S. 70° E. and dips about 55° NE. It is persistent and traceable on the surface for over 1,000 feet, but is narrow, ranging in width from several inches to a maximum of 2 feet.

Diatomaceous Earth Deposit

A large deposit of diatomaceous earth occurs 17 miles south of Fallon, 1-1/2 miles by road off the Fallon-Schurz Highway. Although the deposit has been known for many years, it has been little prospected, and there has been no production.

The deposit covers a group of several well-rounded hills partly capped by basalt. For the most part, the deposit is covered to a depth of several feet with detritus, consisting of basalt boulders and fragments of petrified wood mixed with sand. In one place where the diatomaceous earth is exposed on the side of a hill, a thickness of at least 30 feet is indicated. The material is pure white, homogeneous, and apparently of good quality.

I. X. L. DISTRICT

The I. X. L. district is on the east side of the Stillwater Range in central Churchill County. The Silver Hill section on the west slope of the range is sometimes considered a separate district, but in this paper it is included as part of the I.X.L. The I. X. L. district was organized in 1879.

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e first locations were made in 1878 by Charles S. Kellogg, one of the oneers of Nevada, who was identified with early-day milling operations Virginia City.

A number of properties carrying gold, silver-lead, copper, and silver-ad-zinc were worked in this area in former years, but none of them ever passed e prospect stage. A Mexican smelter, one of the first in Nevada, was erected the district in the early days, but it was unsuccessful. Total production, iefly from the properties in the vicinity of I. X. L. Canyon, has been about 0,000.

Black Prince Group

The Black Prince group of four patented claims owned by Charles E. Kent Stillwater, Nev., is at the upper end of I. X. L. Canyon near the crest of the illwater Range. The mouth of I. X. L. Canyon is 35 miles north of Frenchman's ation on the Lincoln Highway and due west from the Curtis ranch in Dixie lley. From the mouth of the canyon to the claims, a distance of about 3 miles, e road is impassable by automobile but may be traversed on foot or on horse-ck. The property was first located by Charles S. Kellogg in 1878, and Kel-gg and associates prospected the claims in the eighties. It is reported that me ore was hauled across Dixie Valley to the mill in the Bernice district. e last production was made about 1908, when a small shipment of smelting ore s made. Total production has probably been not more than several hundred tons ore. For many years the property has been inactive.

The workings consist of the main Black Prince adit about 100 feet in ngth, several shorter adits, and minor workings, comprising in all about 0 feet of work. The Black Prince adit is open, but the other underground rkings are caved and inaccessible. There is no equipment on the property.

The formation is chiefly limestone intruded by granite. The principal owing is in the Black Prince adit, where the mineralization occurs in an regular contact metamorphic zone, which is traceable on the surface for veral hundred yards. The economic minerals are sphalerite, chalcopyrite, ena in a gangue of epidote, garnet, pyrite, quartz, calcite, and abundant netite. A 10-pound chip sample cut in the Black Prince adit assayed as llows:

	Ounces
Silver	2.70
Gold	Trace
	Percent
Copper	0.10
Lead	.14
Zinc	2.63
Iron	31.10

A second 10-pound sample taken from an open-cut in mineralized limestone ow the Black Prince adit assayed as follows:

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	Ounces
Silver	18.94
Gold	.005
Copper	Nil
	Percent
Lead	9.09
Zinc	6.49
Iron	4.76

A large sample of the material on the dump was tested for scheelite under the ultraviolet lamp, but no scheelite was detected.

Bonanza Group

The Bonanza group of 15 claims, owned by Adolph Giannini, is on the north side of I.X.L. Canyon on the east slope of the Stillwater Range. Activity on these claims began in the late seventies, since which time they have been worked intermittently by various owners and lessees with a production of approximately $20,000 in shipping ore.

Development consists of an adit 300 feet long, several shallow shafts, and other widely scattered workings, comprising in all about 1,500 feet. No mining equipment is on the property; in recent years the claims have been idle.

Ore occurs in several quartz and calcite veins in limestone carrying native silver, horn silver, gold, and lead.

Gold Bar Group

The Gold Bar group of four unpatented claims, owned by Charles P. and Leon Cirac of Fallon, is in Cox's Canyon about 1 mile south of the Revenue group of fluorspar claims. The Cirac Bros. have owned the property for 30 years, and except for a small amount of gold obtained by mortaring and hand-panning, there has been no production.

The workings consist of several adits, the longest about 100 feet, and some scattered prospect holes totaling not more than 200 feet. Equipment on the property consists of tools for hand mining and camp accommodations for two men.

The formation is shale and slate intruded by granodiorite. The sediments are locally crumpled and folded, and in places the shale contains numerous cubes of hematite, pseudomorphic after pyrite. Several quartz veins, up to a maximum of 30 feet in width, with variable strike and dip, occur within the sediments. Insufficient sampling has been done to determine whether the vein material warrants large-scale operation. The economic mineral is gold which occurs in a free state.

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Revenue Group

The Revenue Group of four unpatented fluorspar claims is on the north le of Cox's Canyon on the west slope of the Stillwater Range, 23 miles theast of Stillwater. The deposit was discovered late in 1938 by Cirac s. In April 1939 they were prospecting the claims with the object of ducing a shipping product by hand sorting.

At the time of the writer's visit, the workings comprised several nches and an adit 10 feet in length, which was being driven under the face showings.

The prevailing formation is shale and limestone intruded by a fine-ined basis dike, which has an undulating outcrop traceable for about 00 feet; in places, fluorspar up to 5 feet in width occurs along both les of the dike. Near the surface, the spar is considerably mixed with rital material, but boulders of solid spar up to 60 pounds in weight had n excavated from the shallow workings. In places the limestone adjacent the dike is traversed with a network of fluorspar veinlets over widths up 20 feet, but this material would have to be concentrated to make a com-rcial product. The fluorite is green, purple, white and black. Although y a small amount of work had been done, the showings appear very promising, l when a greater depth is obtained it is probable that a commercial product be obtained by hand-sorting. Working of the deposit is handicapped by r transportation facilities, since the road from Stillwater is in poor dition and impassable in wet weather. The most convenient shipping point Fallon, on the Southern Pacific R. R., 38 miles southwest.

JESSUP DISTRICT

The Jessup district is in the range of low hills at the southwest end the Trinity Range in northwestern Churchill County. Huxley station, on Southern Pacific R. R., is 10 miles southwest. The district is easily essible by automobile over a desert road 4 miles in length, which branches the Victory Highway at a point 26 miles southwest of Lovelock, the county t of Pershing County.

The first location in the Jessup district was made by Frank Jessup and E. Murray in 1908, and in the same year John Macedon and associates shipped eral carloads of ore from the Gold King claim reported to have averaged ter than $100 per ton. Considerable activity in the district followed, a number of small companies were organized, which, with lessees, were ive in the camp in 1908 and 1909. Although considerable shallow develop-t work was done over an area at least 1 mile in length and 1/2 mile in th, the results were not encouraging, and the camp became inactive except sporadic leasing and prospecting operations. The total production of pping ore from the district, largely from the Gold King claim, has been ut $15,000.

Groups of claims are held in the district by Charles Polk, Albert Loose, O. Westergard, Emil Stank, Geo. W. Lang, Olaf Johnson, and others from elock, Nev. The claims have been prospected by at least 20 shallow shafts l

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and a number of adits and open-cuts totaling about 3,000 feet. None of the workings are more than 200 feet below the surface. No water is available in the immediate vicinity of the camp and must be hauled for domestic use from Hot Springs station on the Victory Highway or other places. In the fall of 1938 the only activity in the area was on the Valley King group of claims, which was being worked by lessees.

Valley King Group

The Valley King group, consisting of five unpatented claims, is owned jointly by George W. Lang and Olaf Johnson of Lovelock. The Gold King, the original discovery claim adjoining the Valley King group, is owned by George W. Lang individually. In 1938 the Valley King group was under lease to Kenneth Dale and Dick Collins. The lessees, after mining and shipping about 30 tons of ore, averaging $40 per ton, to the Dayton custom mill at Silver City, Nev., relinquished the lease.

The Valley King single-compartment shaft attained a depth of 150 feet. Other scattered shafts and subsidiary workings total about 1,000 feet. No equipment other than tools for hand mining is on the property.

The formation is chiefly andesite and rhyolite. The economic minerals are gold and silver occurring in small veins ranging in width from a few inches to 1 foot. The principal vein strikes N. 25° E. and dips 60° to 70° SE. The gold is in a free state, and the silver occurs as cerargyrite in a gangue of quartz and crushed country rock impregnated with iron oxides. A small amount of scheelite occurs in the vein material.

In 1932 Olaf Johnson discovered placer gold on the top of a small hill on the Valley King claim. The alluvium, largely clay with a few small boulders and well-rounded pebbles, is cemented with lime. Several ounces of gold have been produced by dry-washing methods. The gold which is associated with black sands, has a fineness of about 600.

Diatomaceous Earth

Diatomaceous earth outcrops along the eastern foothills of the Trinity Range north and south of Jessup for 15 miles. The deposits appear to be very extensive laterally, but little work has been done to determine their thickness. For the most part the diatomaceous earth is covered with alluvial material eroded from the nearby mountains; where exposed, it is mixed with some volcanic ash. The only production has been a few carloads used locally for insulation purposes.

LAKE DISTRICT

The Lake district is on the east side of the Humboldt Sink at the southern extremity of the Humboldt Range. The salt-producing section near Huxley station on the Southern Pacific R. R. is known as White Plains Flat.

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The principal production from the district has been salt from salines in Humboldt Sink. A small amount of shell limestone also has been produced agricultural purposes from deposits near Huxley station on the Southern ific R. R. Sodium nitrate also occurs in the district, but none has been duced.

Limestone Deposit

A deposit of shell limestone occurs on the southwest flank of the boldt Range about 1 mile northeast of Huxley station on the Southern ific R. R. The main part of the deposit probably is on patented rail- d land. A small tonnage of limestone for agricultural purposes was mined ut 30 years ago and shipped to the Pacific coast. The remains of an abandon- kiln on the deposit is evidence that an attempt was made to burn the limestone ally for lime.

The deposit is of lacustrine origin, composed of fresh-water mollusks. re exposed, it covers an area approximately 3,000 feet long and 1,000 feet le. The deposit was formed in an arm of ancient Lake Lahontan and, judging m its origin, is probably not more than 10 feet thick. A number of scattered m-cuts expose the material to a depth of 4 to 6 feet. Because of its proximity the railroad, its purity, and the ease with which it can be mined, the deposit of potential value as a source of limestone for agricultural use on the ific coast.

White Plains Salt Deposit

The White Plains salt deposit, on the main line of the Southern Pacific R. R., been a notable source of salt production in Nevada. It was discovered by ter Schmidt in 1870, and shortly after it was acquired by the Desert Crystal t Co., which operated for many years. The salt was produced by solar evapora- n in a series of vats dug in the surface of Humboldt Sink. The vats comprised otal length of 8,500 feet and were 55 feet in width. The brine was pumped o the vats from salt springs in the vicinity. Beginning in 1911, the ernational Salt Co., operating under lease from the Desert Crystal Salt Co., duced small amounts of salt annually for several years; the last production record was in 1915. Although the bulk of the salt obtained here was used in reduction of silver ores in the early days, some salt was also refined for estic and dairy purposes.

In addition to the springs, salt in the form of an incrustation on the face of Humboldt Sink covers an extensive area. Although the reserves are doubt large, the deposit is too remote from large consuming centers to compete h other sources of supply.

Sodium Nitrate Deposit

Sodium nitrate has been found over a considerable area on the southeast e of the Humboldt Sink in the low hills constituting part of Humboldt Range. of the hills, of a marked red color, is known as Niter Butte. The existence nitrate salt in this locality is said to have been known to the early Indians,

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who used it for its supposed medicinal value. Walter Schmidt located the first nitrate claims in the district in 1868. Attention was called to the nitrate deposits in the eighties by an encouraging report prepared by B. B. Redding, which was read before the California Academy of Sciences. A company known as the Nevada Niter Co. was organized and acquired an extensive acreage of nitrate lands, but after a short period of desultory prospecting the venture was abandoned. Interest was revived about 1902, when a group of Lovelock residents located and patented 320 acres.

This ground was bonded to Detroit interests, which organized the American Nitrate & Potash Co. This company did a small amount of work, but as results proved disappointing the project was abandoned. There is no record of any production of nitrates, and for many years there has been no activity on the ground. A description of the deposits is given by Gale.[11/] The sodium nitrate occurs in small irregular seams and bunches in places that are protected from weathering. It is associated with other salts, chiefly sodium chloride. The occurrences of the nitrate are small and scattered, and the outlook for their commercial exploitation is discouraging.

LA PLATA DISTRICT

La Plata, also known as the Mountain Well district, is in central Churchhill County on the eastern slope of Stillwater Range, about 12 miles in an air line a little west of north from Bermond (Frenchman's station) on the Lincoln Highway (U. S. Route 50). The nearest railroad station is Fallon, about 50 miles west by road via Dixie Valley. The old road from Fallon via Stillwater is considerably shorter, but part of the road from Stillwater to Mountain Well near the summit of the range is in poor condition and seldom used.

The La Plata district, discovered in 1862, attained considerable prominence as a boom camp during the middle sixties, but there is little evidence to show that any appreciable amount of ore was produced. The town of La Plata, established about 1863, was the county seat of Churchill County from 1864 to 1868. In 1863 and several years afterward many claims were located, many of which were sold to eastern capitalists, who did considerable prospecting, but the general results were discouraging. The county seat was removed to Stillwater in 1868, and the following year most of the miners deserted the district for the White Pine boom in the eastern part of the State.

In 1864 the Silver Wave Mining Co. erected a 10-stamp mill at La Plata at a cost of $150,000, but little evidence, such as tailings or extensive mine workings exists to indicate a large production. This mill was removed subsequently to the Ellsworth district in Nye County. Another mill was built in Eleven-Mile Canyon, several miles north of La Plata Canyon, about 1864, which likewise was unsuccessful, presumably for lack of ore.

11/ Gale, H. S., Nitrate Deposits: Geol. Survey Bull. 523, 1912, pp. 19-25.

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From 1869 to the present, the only mining activity has been sporadic rospecting operations. Over the last 35 years mineral-production statistics how several small shipments of silver ore. In April 1939 the district was nactive. Fluorite was discovered there in 1939.

La Plata Mine

A group of unpatented claims, comprising the old La Plata mine and mill-ite, was relocated in January 1939 by F. J. Sur, Lewis Barr, and J. C. Stewart f Fallon, Nev.

Development consists of an incline shaft, several adits, and other work-ngs, totaling approximately several thousand feet. Some of the workings are ved and inaccessible.

The prevailing formation is shale intruded by granite. The La Plata ein, as exposed in a small stope open at the surface, is in granite. The vein trikes E. and W. and dips 60° N. Other quartz veins, either in the granite or the shale outcrop in the vicinity, have been prospected superficially by pen-cuts. The economic mineral is silver.

Michigan Claim

The Michigan claim was located by Mark Harris and Fred T. Pine, of West-te, Nev., in the early part of 1939 as a fluorspar prospect. The claim is the lower part of La Plata Canyon about 2 miles below the old La Plata wnsite. Only location work had been done on the claim to April 1939.

Limestone intruded by rhyolite is the prevailing formation. Fluorspar curs in a series of small fractures in the limestone striking about east-st and traceable on the surface for several hundred feet. From surface owings, the fluorite veins are too small to be commercially important.

LEETE DISTRICT

The Leete district is in northwest Churchill County at Leeteville on e Southern Pacific R. R. 18 miles east of Wadsworth in Washoe County. In mer years the Playa lake from which salt was produced was known as the gle salt marsh, while that which produced borax was called Hot Springs ax marsh. Salt was first produced here in 1870 by a man named Leete, discovered the deposit and organized the Eagle salt works. Large ntities of salt were produced annually for many years to supply the ver mills on the Comstock and later for dairy and domestic use. This posit, because of better transportation facilities, supplied salt to the stock mills in competition with other sources of supply, particularly Sand ings Marsh. (The Central Pacific, now the Southern Pacific R. R., was com-ted May 10, 1869.) The Eagle salt works continued to produce salt inter-tently until 1915, when operations ceased. A small amount of borax was duced from the salines in 1871, but the venture was unsuccessful. From 1879 1884 the production of salt amounted to 334,000 tons, and the total production bably has exceeded 500,000 tons.

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The Playa lake in which the salt and borax occur is a desert mud plain of recent age covered during the summer months with a white saline efflorescence. The salt was recovered by solar evaporation. The saturated brine occurring about 20 feet below the surface was pumped into shallow excavated vats enclosed by low embankments. The vats were 50 feet wide and about 100 feet long and covered a considerable area. The saturated salt solution crystallized on the sides and bottoms of the vats, and, by successive evaporations, a layer of salt was formed that was thick enough to be hoed into piles and shipped without further refining. One acre of vats produced 10 tons of salt daily during good weather. The season lasted from June to October.

SAND SPRINGS DISTRICT

The Sand Springs district is 25 to 30 miles southeast of Fallon, the nearest railroad point. The Sand Springs salt marsh in this area is a playa lake covering nearly 40 square miles in Salt Springs Valley, known in the early days as Alkali Valley and recently as Four-Mile and Eight-Mile Flats. Salt production began in 1863; previous to 1870 considerable quantities of salt for the reduction of silver ores on the Comstock were produced. After 1870, salt for metallurgical purposes could be obtained more cheaply from the deposits in the Leete district because of better transportation facilities; therefore salt production at Sand Springs was discontinued temporarily. In recent years the Sand Springs salt field has been worked by small companies and individuals to supply salt for local dairy and table purposes.

Borax was discovered in the Sand Springs salt marsh about 1869, and the American Borax Co. erected a plant, which operated for several years.

The gold deposits of the Dan Tucker property and vicinity were first prospected in 1905 by C. W. Kinney. The production of metals, chiefly gold, has been about $30,000, most of which was from the Dan Tucker mine.

Dan Tucker Mine

The Dan Tucker mine comprises a group of 5 unpatented claims situated near the Lincoln Highway 31 miles southeast of Fallon, Nev., the nearest railroad station and supply center. Although the property was prospected by C. W. Kinney in 1905, very little work was done until 1912, when Leslie L. Leon and C. W. Kinney sank a 100-foot shaft. The first production was made in 1919 lessees, who shipped three carloads of ore yielding $215 to $300 per ton. The Dan Tucker Mining Co. was organized in 1925, and in the following year it lease the mine to Smith, Towle, and Young, who in 1927 erected a small amalgamation mill at Sand Springs in which 1,000 tons of ore was treated. In 1931 the property was acquired by another company, and in 1938 it was awarded to E. E. Tailleur, Fred Tailleur, and Dick Kemp on a labor lien. The owners proceeded to work the mine and shipped 10 carloads of rich ore. In the fall of the same year those connected with the Bralorne Mines, Ltd., of British Columbia, obtained a lease and bond and organized the Summit King Mines, Ltd., a subsidiary, to operate the Dan Tucker and other properties in the vicinity. In April 1939 the company had 12 men on development. Production from the Dan Tucker mine is reported to have been about $30,000, mostly shipping ore.

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Workings comprise three shafts, the deepest of which is 200 feet, and sidiary workings totaling approximately 1,000 feet. Equipment includes a soline hoist, a two-stage, air-cooled compressor, a blacksmith shop, and eral camp buildings.

The formation is schist, limestone, and andesite. Free gold occurs in ns in a silicified zone striking east and west with a moderate dip to the th. The zone is traceable on the surface for several miles. The economic erals are silver chloride and gold in a gangue of sugary quartz and crushed esite.

Salt Deposits

The following data on the production of salt from the sand Springs marsh the early days are from Browne:[12]

> The most productive salt bed at the present time is that of the Sand Spring Salt Mining Co., 75 miles east of Virginia City. The claim of this company, consisting of 1,600 acres, occupies a depression in the southeastern corner of an extensive alkali flat, the center of which for a space of several hundred acres is damp and marshy, and some portion of it is covered with a few inches of water. This damp surface is coated to a depth of two or three inches with a crystallized incrustation of salt with which the clayey strata below are charged. On removing this coating of salt, a thin body of fine white clay is exposed overlying a stratum of soft black clay, which in turn rests upon a seam of green and black clay containing coarse globules of salt. Beneath this seam occurs a deposit of crystallized salt, hard and massive but of unascertained thickness. In collecting the salt at this place, a tract embracing a score of acres or more is selected and divided into strips, from each of which, in regular order, it is scraped into large heaps with a broad wooden hoe. These heaps, after being exposed for a few days to drain and dry, are conveyed in wheelbarrows or cars running on wooden tracks laid down for the purpose of facilitating transportation over the soft ground, and thrown upon platforms or dumps, when the salt is ready for sacking and shipment to market. After one of the surface sections has been stripped of salt, the incrustation immediately begins to reform, and so rapidly do the secretions from the saliniferous clays below proceed, that a few weeks, and sometimes less, is sufficient to fully replace it, admitting the gathering of a fresh crop at least every month. As the masses of crystallized salt underlying these clayey strata are probably inexhaustible, it would seem as if this process of replenishment might go on forever.
>
> Prior to 1862, all the salt used in Nevada was brought from San Francisco, at an average cost, laid down in Virginia City, of about $150 per ton. During that year parties having imported a herd of camels

[12] Browne, J. Ross, Resources of the States and Territories West of the Rocky Mountains: U. S. Gov. Printing Office, Washington, 1869, pp. 310-311.

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for the purpose began packing this commodity in from salt pools, 45 miles southeast of Walker Lake (Rhodes marsh in Mineral County), whereby the price was somewhat reduced. The following year, the Sand Springs Salt Co. having commenced operations, the price of salt suffered a further reduction, and for the past two years salt has been delivered to the mills about Virginia City at the uniform rate of $60 per ton, being considerably less than the average cost of freight from San Francisco. During the year 1865, this company disposed of about 150, and during the past year 250 tons of salt per month, most of which was consumed in the mills and reduction works, a little, also, after grinding, having been used for meat packing and culinary purposes, for which it is well adapted. The Sand Springs Salt Co. has over $100,000 invested in this business, and though owning several large teams, hire many others to haul the product of their salt fields to market, their freight bills amounting to from $10,000 to $15,000 per week. Large as is the amount of salt they are thus enabled to deliver, the supply is scarcely equal to the demand, some of the larger mills consuming between 35 and 40 tons per month.

Sand Springs salt marsh is a playa lake formed by the evaporation of a shallow body of water in an enclosed basin. During the winter months water collects on the surface of the basin, forming a sheet of brine perhaps 15 or 20 square miles in area, but during the summer this water evaporates, leaving a layer of salt several inches thick. The salines consist largely of sodium chloride, sodium sulfate, and sodium carbonate, with smaller amounts of sodium borate, potassium chloride, and calcium compounds. Magnesium salts are characteristically absent. This playa, as well as others in the Great Basin region, originated by repeated desiccations rather than by the singular evaporation of the deep lake, and in consequence the salts are considerably intermixed with clay and silt brought into the basin by surface drainage of the surrounding areas.

In recent years smaller quantities of salt have been collected annually from the surface of the marsh to supply the local demand for stock and dairy purposes. It is gathered by shoveling into trucks and does not undergo any refining process.

Borax Deposits

The recovery of borax from Sand Springs marsh was one of the pioneer projects of this nature in the Great Basin region. The borax plants at Sand Spr operated in 1870 and 1871 with a capacity of about 1 ton of borax per day. Production ceased in 1872 because of a drop in price of boracic acid from 30 cents to 9 cents per pound.

The most characteristic borate mineral of the playa-lake deposits, such as Sand Springs marsh, is ulexite, a hydrous borate of sodium and calcium, commonly referred to as cotton balls, occurring around the periphery of the marsh near the surface. The material worked in the early days contained abou 10 percent borax, although some of it yielded as much as 30 percent.

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The process for the recovery of borates from the saline deposits was mple; the cotton balls were either picked by hand from the shallow excava-ons in the mud, or the richest portion of the boraciferous mud was shoveled om the surface, and the material thus collected was hauled to semicircular on pans set on a foundation of brick and fired from beneath with sagebrush pinion. The pans were charged with water and crude borates and stirred th poles until the soluble salts dissolved, after which the liquor was wn off into crystallizing vats wherein the borax was crystallized out on res. In deposits where the soluble carbonates were not present in excess, dium carbonate was added in the firing pans to break up the lime and boric id as found in ulexite. The borax obtained by crystallization was again fined by a second crystallization in the same manner.

SHADY RUN DISTRICT

The Shady Run district is on the western slope of the Stillwater Range miles northeast of Stillwater and 40 miles southeast of Lovelock, the nearest ilroad connection. It embraces an area lying between Fondaway Canyon on the rth and Mill Canyon on the south. The I.X.L. district adjoins it on the south d the White Cloud district on the north. Although a number of gold and silver-ad prospects were worked in this area in the early days, no deposits of com-rcial importance were found and there is no record of any production. A small stom mill was erected in Mill Canyon in the eighties by a group of miners from rginia City, including John Fondaway, G. W. Humphrey, and Isaac Zintmeyer, but was unsuccessful. Probably the last work in the district was done about 1916 D. G. Zinn and associates on a gold prospect on the north side of Fondaway nyon. Here the vein is in quartzite near a quartz-porphyry intrusive. In ady Run Canyon, south of Fondaway Canyon, are several gold prospects in artzite. According to John T. Reid of Lovelock, a short distance south of e mouth of Fondaway Canyon near the summit of a small butte, isolated from e main range, is a flat vein that in former years was prospected for gold by B. Jenkins and associates.

SODA LAKES DISTRICT

The Soda Lakes are on the edge of the Carson Sink 2 miles northeast of the mer site of Ragtown - an emigrant station on the Overland Route to California - iles northwest of Fallon. The occurrence of soda in Little Soda Lake was covered by Asa L. Kenyon in 1855, and in the late sixties borax was discovered the brine of Big Soda Lake by William Troup. In 1868 Kenyon sold Little Soda e to a San Francisco group, which organized a company and began the production soda. This was the first production of soda in Nevada and probably the first any importance in the West. The production of soda from Big Soda Lake was un in 1875 and continued until 1893. The combined annual yield from both ces ranged between 300 and 800 tons of soda between 1868 and 1893. About 9 William Troup and associates attempted to produce borax from Big Soda Lake, this venture was unsuccessful.

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According to Russell,[13] the two lakes occupy deep depressions formed by extinct volcanic craters. Big Soda Lake is nearly circular, with an area of 268-1/2 acres; Little Soda Lake is smaller and varies considerably in size according to weather conditions. The rim of the larger lake rises 80 feet above the surrounding desert and was 165 feet higher than the surface of the lake when the latter was 147 feet deep. The volcanic cones of basalt were not formed during a single eruption but have a long and complicated history; they are perhaps sublacustrine in their origin. There are no streams either tributary to or draining these lakes; the water in them is supplied almost entirely from subterranean sources. The rocks, pebbles, and organic matter along the shore lines of the lakes are coated white with crystals of gaylussite ($Na_2CO_3.CaCO_3.5H_2O$) and trona ($HNa_3(CO_3)_2.2H_2O$). At the time of Russel's investigation the larger lake was calculated to contain about 2,000,000 tons of salts, of which 428,000 tons was sodium carbonate, 342,000 tons sodium sulfate, and 1,284,000 tons sodium chloride, these being the principal salts of economic importance. The brines of Soda Lakes have been considerably diluted in recent years by infiltrating waters from the Truckee-Carson irrigation project.

The method employed to produce sodium carbonate from Soda Lakes has been described by Knapp[14] and, briefly, was as follows:

The brine carrying the sodium carbonate and other salts in solution was pumped into vats dug in the clay beds in the vicinity, where it was evaporated by solar heat. After the solution had attained a density of 29° to 30° B, it was conducted to a crystallizing vat. If the solar heat was sufficient to keep the temperature up to 75° F. or above, the density was run up still higher. As crystallization of the sodium carbonate progressed, strong solution was added at intervals and the waste solution was decanted. During warm weather a hard cake of the sesquicarbonate of soda accumulated to a depth of a few inches to 1 foot in the bottom of the crystallizing vat. With the approach of cold weather the cake was broken, taken out of the vats, washed, and dried in the air. The air-dried material had the following composition:

	Percent
Bicarbonate of soda.....	36.46
Carbonate of soda.....	45.96
Chloride of soda.....	.32
Sulfate of soda.....	1.25
Water.....	16.16
Insoluble.....	.02
Total.....	100.17

13/ Russel, I. C., Geological History of Lake Lahontan: Geol. Survey Monograph 1885, pp. 73-80.

14/ Knapp, S. A., Occurrence and Treatment of the Carbonate of Soda Deposits in the Great Basin: Min. and Sci. Press, Vol. 77, 1898, p. 448.

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After the material was air-dried, it was heated in either a revolving or reverberatory-type furnace to drive off the water of crystallization and excess carbonic acid, leaving a nearly pure anhydrous monocarbonate of soda, or soda ash, which was ground and sacked for shipment.

The foregoing process is based on the principle that if bicarbonate and carbonate of soda are present in a dense solution 1 molecule of bicarbonate will unite with 1 molecule of carbonate to form sesqui carbonate, or trona, which precipitates, while sodium chloride will remain in solution unless the solution density rises above 32° B., and sodium sulfate will remain in solution up to 34° B., providing the temperature stays above 75° F.

By the foregoing process only about 25 percent of the available soda is recovered, but since the cost of handling the solution was merely a question of pumping, the low extraction was not a cause for great concern.

Some soda was also obtained in solid form from Little Soda Lake, where it occurred in a layer about 2 feet thick near the surface.

TABLE MOUNTAIN DISTRICT

The Table Mountain, Bolivia or Boyer, district is in the Stillwater Range in north-central Churchill County near the Pershing County border. The central part of the district is 57 miles north of Bermond (Frenchman's station) on the Lincoln Highway. It is also accessible from Lovelock on the Victory Highway or from Winnemucca on the Southern Pacific R. R. The distance from Winnemucca to the Boyer ranch in Dixie Valley is 87 miles; the road passes through Grass and Pleasant Valleys.

The district covers a large, vaguely defined area that contains a variety of minerals, including nickel-cobalt, copper, lead-silver, antimony, titanium, gold, and kaolin. From the viewpoint of past production, the gold deposits have been the most important.

Nickel-Cobalt Deposits

There are two nickel-cobalt occurrences in the Table Mountain district that were of sufficient importance to induce a number of attempts at exploitation in former years. The deposits are situated in the vicinity of the old camp of Bolivia about 3 miles up Cottonwood Canyon on the east slope of the Stillwater Range. The mouth of Cottonwood Canyon is 1-1/2 miles N. 35° W. from the Boyer ranch in Dixie Valley. There is a uniform grade up the canyon, but in several places the road has been washed out and some repair work is necessary to make it passable for automobile. Cottonwood Creek of variable flow, is fed by melting snows and springs; the flow may exceed a thousand gallons per minute during certain periods.

The nickel mine at Camp Bolivia was discovered in 1880 by John Mason, Charles Bell, and his brother, William. The Lovelock or Cobalt mine, about 1 mile west, was located at the same time by George Lovelock, Sr. The mines were prospected for a number of years, following their discovery, and the first ore is said to have been shipped to Swansea, Wales, from the Lovelock mine by

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W. S. Keyes, a prominent early-day mine operator from Eureka, Nev. In 1887 an English company bonded the property and shipped a few tons of rich ore but did not complete the purchase. Subsequently, it was again bonded to an English syndicate, which organized the Nevada Nickel Co., which shipped about 15 tons of ore to San Francisco. In the late eighties the company erected a sulfuric acid leaching plant at the mine at a cost of $50,000, but this venture was unsuccessful owing to the fact that the Italian chemist who designed the plant was unfamiliar with the metallurgy of nickel-cobalt ores. Later, a 5-ton-capacity water-jacketed furnace was erected at the Nickel mine, but it blew up a short time after it was placed in operation. In the late eighties a small smelting furnace was also erected at the Lovelock mine by George and Frank Bothwell and associates from New York, and from the size of the slag dumps not more than 100 tons of ore was treated. The Lovelock mine was last worked by the Mines Development Co. of Nevada. This company produced several carloads of ore that assayed as high as 26 percent copper with a small amount of nickel and cobalt. From the same vein that produced the copper ore, a few tons of nickel-cobalt ore was mined that yielded 29 percent nickel. It is also reported that 500 tons of nickel-cobalt ore was shipped from the Lovelock mine to Swansea, Wales, in the early eighties.

The mines were worked fairly continuously from 1880 to 1890, when they closed because of litigation and reopened in 1904 only to close again in 1908, since which time they have been inactive. Several years ago the Lovelock mine, comprising two patented claims, and the Nickel mine, of four unpatented claims, were purchased from the county for delinquent taxes by Tasker L. Oddie and Fred H. Luetjens of Reno, Nev.

The workings at the Nickel mine comprise about six short adits and an inclined shaft about 100 feet deep. None of the workings are more than 100 feet from the surface. There is no equipment except several dilapidated camp buildings and the ruins of the old leaching plant, consisting of mill building, leaching vats, and boiler.

In the vicinity of the Nickel mine the formation is diorite, andesite, and fine-grain quartzite, the latter forming a bold and jagged ridge above the mine workings. Some quartzite on the dumps shows the characteristic stain of arsenic minerals, with little evidence of cobalt-nickel mineralization. The nickel-cobalt ore occurs in small stringers up to several inches in width in the sheared and brecciated andesite near a fault contact striking N. 45° E. and dipping NW the diorite forming the footwall. According to analyses made by Professor Newberry,[15] the samples from the greatest depth contain niccolite, which in the upper levels consists entirely of hydrated arseniate, or annabergite, containing 33.71 percent nickel oxide, 36.44 percent arsenic acid, and 24.77 percent water. The sample lot of 15 tons mined in the early days contained 12 percent nickel, 7 percent cobalt, and 29 percent arsenic. The material on the dumps is all oxidized; no sulfide minerals were detected. A 10-pound sample gathered from the dumps by the writer assayed 7.13 percent nickel and 0.33 percent cobalt

15/ Newberry, S. B., Mineral Resources of the United States, 1883 and 1884: Geol. Survey, p. 539.

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At the Lovelock mine the ore is more complex and in addition to nickel nd cobalt contains copper. A number of specimens of erythrite (cobalt bloom) ere found on the dumps. Here, likewise, the mineralization occurs in the ndesite near a contact with diorite striking N. 40° E. and dipping 50° to 0° NW. A number of ramifying seams of gypsum occur in the andesite. Two 0-pound samples taken from the mine dumps contained 0.40 percent nickel and .25 percent cobalt, and 0.46 percent nickel and 0.26 percent cobalt, respectively.

Workings on the Lovelock claims are all superficial in character and total pproximately 1,000 feet.

Copper Deposits

A number of copper prospects occur on Treasure Box Hill at the head of ell Mare Canyon south of Cottonwood Canyon. Deposits are reached on horseback p Cottonwood Canyon past the nickel properties. From Boyer ranch the distance s about 15 miles. The principal properties were located in the early sixties y Alva Boyer, C. S. Kellogg, Jacob Strananger, and Patrick Reid. In the early ays several wagon trains of rich, hand-sorted copper ore were mined from surace workings and taken to Sacramento for transportation to Swansea, Wales. In bout 1900, a group from Colorado erected a small smelting furnace on the Azurite-evada Queen group of claims, which is still intact, but, judging from the condiion of the smelter, no ore was reduced. About 1910 the Boyer Copper Mines Co. cquired control of 49 claims and did some development work and diamond drilling, ut there was no production. In recent years claims have been idle.

The Treasure Box group of six patented claims is owned by the V. A. Twegg state, the Crawfton Uniace estate, and John T. Reid, the latter of Lovelock, ev. The adjoining Azurite-Nevada Queen group of five patented claims is owned y Tasker L. Oddie and Fred H. Luetjens, both of Reno, Nev.

The Azurite-Nevada Queen claims have been prospected by several adits and number of open-cuts and the Treasure Box group by an old shaft reported to be 70 feet deep, two adits, one 800 feet long, and subsidiary drifts, raises, and inzes, totaling on the two groups of claims about 1,500 feet of workings. Most f the workings are caved and inaccessible. There is no equipment on either coperty except the old smelter.

According to Carpenter,[16/] the copper ore occurs near the contact of andesite orphyry flow, overlying an earlier mass of strongly faulted green andesite. The ain work on Treasure Box Hill was done in a bed of copper-bearing andesite about 0 feet thick. The contact dips about 20° NW. The ore is chiefly chalcopyrite isseminated through the green andesite and, according to Carpenter, the lower) feet of the bed averages nearly 5 percent copper and $1 in gold with a trace f silver. In places just above the contact small, iron-capped veins occur in e green andesite and the andesite porphyry. When followed downward, these eins lead to massive chalcocite disseminated in a gangue of breccia, and pieces

16/ Carpenter, Arthur Howe, Boyer Copper Deposits, Nevada: Min. and Sci. Press, Vol. 103, 1911, pp. 804-805.

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of pure black sulfides as large as a man's hand have been found occasionally. Massive bornite, tenorite, and cuprite also occur mixed with the two carbonates - malachite and azurite, - making small deposits of rich ore. Development by the Boyer Copper Mines Co. exposed a block of ore 200 feet long, 100 feet wide, and 500 feet deep, measured on the dip, containing 1.7 percent copper and about $0.7 in gold per ton.

Dixie Comstock Mine

The Dixie Comstock mine, comprising 10 claims, is on the west side of Dixie Valley in the foothills of the Stillwater Range, about 45 miles north of Bermond on the Lincoln Highway. The property was discovered in April 1934 by Clyde Garrett, and shortly thereafter the controlling interest in the property was acquired by the Comstock Keystone Mining Co. of Virginia City, Nev. In the spring of 1935, a 30-ton-daily-capacity amalgamation mill was erected at the mi and late in the summer of the same year flotation equipment was added. Incompl data indicate that the production of gold and a little silver has been about $150,000 in shipping and milling ore. In 1939 the tailings pile, containing about 6,000 tons, was being reworked by the company, and several lessees were employed in the mine.

Development includes a 200-foot incline, a vertical shaft about 100 feet deep, and drifts, winzes, and other workings, totaling about 1,500 feet. Minin equipment includes a 12-by 10-inch single-stage compressor, a 17-horsepower Hercules geared hoist, and a blacksmith shop. Milling equipment consists of a homemade ball mill 7 by 5 feet, 9-by 12-inch Blake-type crusher, simplex classi fier, 4-by 10-foot, amalgamating plate, and four flotation cells. Power is furnished by an 80-horsepower 2-cylinder Fairbanks-Morse Diesel engine belt-connected to a 30-kilowatt alternating-current generator. Camp buildings at th mine can accommodate a crew of 15 men. Water for milling is supplied by a well 30 feet deep near the mine.

Gold, associated with a little silver, occurs in a large vein in a hydrothermally altered igneous formation. Mining is hindered by the intense heat and a large volume of hot water in the mine workings less than 75 feet fr the surface.

Kaolin Deposit

An extensive deposit of kaolin occurs in the vicinity of New York Canyon the west slope of the Stillwater Range about 25 miles southeast of Lovelock, Pershing County, the nearest railroad point. Very little work has been done o the deposit, and no production has been made. According to Buwalda,17/ the cla appears to be a sedimentary deposit lying on a series of Paleozoic sandstones and shales, of which it is probably a member. The clay occurs in a stratum 75 100 feet thick extending for about 4 miles along the base of the range. In pl

17/ Ries, H., Bayley, W. S., and others, High-Grade Clays of the Eastern United States, With Notes on Some Western Clays: Geol. Survey Bull. 708, pp. 122-123, 1922.

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t is covered to a shallow depth by alluvium, but it could easily be mined in arge quantities by open-cut method. The material is white and gritty and ontains abundant quartz grains, grains of rutile sparsely disseminated and in laces stained with iron oxide.

Fire-tested at 1,150° C., the absorption was 32.4, porosity 48.9, and olor white; at 1,300° C. absorption was 28.9, porosity 45.2, and color cream hite.

Dixie Marsh

Dixie marsh (also known as Humboldt salt marsh) is about 40 miles north f Frenchman's station on the Lincoln Highway, and it covers an area of nearly 0 square miles in the lowest portion of Dixie Valley between the Stillwater and lan Alpine Ranges. The valley was known as Osobb Valley by the geologists of he Fortieth Parallel Survey.

The marsh was first exploited for salt in the sixties by John and Wm. Guthrie f Winnemucca, Nev., and associates. Prior to the completion of the Central acific R. R. across the State in 1869, considerable quantities of salt were auled by "bull" teams to the Humboldt, Reese River, and Comstock districts in evada, and some was shipped as far as Silver City, Idaho, for metallurgical use. ith the decline of silver milling by the Washoe and Reese River processes, the roduction of salt ceased and, owing to the isolation of the deposit from con- uming centers, no attempts were made to mine salt for other purposes. Some orax was produced from the north end of the marsh in the early seventies.

Several projects were initiated for the recovery of potash from the brines nd saline muds in the marsh before and during the World War, but these efforts roved fruitless as far as production of potash is concerned. The Federal eological Survey tested the salines in Dixie marsh with special reference to otash in 1916, and during the same year prospecting for potash was taken up y the Railroad Valley Co. of Tonopah, Nev. The Railroad Valley Co. sank three oles ranging from 71 to 98 feet in depth, and sampling results of the salts btained by evaporating the brines showed 28.70 to 38.70 grams of solids per 00 cubic centimeters of material. The percentage of K_2O in the total solids anged from 0.19 to 0.75 percent, too low to be considered of economic importance. he approximate amount of other salts present in the solids is NaCl, 27 percent; a_2SO_4, 5 percent; and Na_2CO_3, 4 percent.

In December 1917, a group from Fallon, Nev., again took up the Dixie Valley otash project and formed the Nevada Potash Syndicate, but the venture proved nsuccessful. In recent years there has been no activity.

The Dixie marsh was formerly the site of a shallow lake, the evaporation f which produced a mixture of salts including sodium chloride, sodium sulfate, d sodium carbonate, with smaller amounts of sodium borate and potash salts ssociated with silt and mud. Sodium chloride occurs as an efflorescence in the west part of the basin, covering an area of about 9 square miles. The surface ilt layer is underlain by a series of salt and saline mud strata to a maximum pth of probably several hundred feet. When the salt deposit was exploited, it

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was simply hoed into piles and shipped without refining. The borate mineral was chiefly ulexite or "cotton balls" that occurred as aggregates of acicular crystals.

Other Mines and Prospects

In the Table Mountain area on both sides of the Stillwater Range are a number of prospects that were active in the sixties, and a few have made a small production.

About 15 miles north of the I. X. L. district on the west slope of the ran is the Marvel district, which was the scene of a little activity about 1911, when a group from San Francisco did some prospecting on several small and badly faulted gold veins near the summit of the range. The veins are in a sedimentary formation that has been intruded by diorite. There is no record of any production.

In the northern part of the Table Mountain district in Pershing County is the Linda-Jo mine, which was discovered and worked by Charles Gilbert in the late seventies. The economic minerals are lead-silver and a little gold occurring in a quartz vein in limestone. The discoverers are reported to have shipped about $30,000 in ore from shallow surface diggings. A note on this property is contained in an early report by the State mineralogist[18] and is as follows:

> Recently some very rich ore has been found in the Linda-Jo mine. Five and one-half tons taken to Winnemucca for treatment gave assays as high as $3,000 per ton, and it is estimated that the whole amount will yield nearly $1,000 per ton. The vein is about 5 feet in width, 1 foot of which yields the rich ore. A shaft has been sunk on the vein to a depth of 16 feet.

Between the Boyer ranch and Dixie mine, a distance of about 12 miles on the east side of the Stillwater Range, are several quartz veins carrying gold. A group of claims owned by Tasker L. Oddie and Fred H. Luetjens was worked in 1938 by lessees, who shipped about 25 tons of ore averaging $40 per ton. Near the quartz veins are irregular feldspathic masses containing aggregates of sma crystals of rutile and octahedrite. Other gangue minerals, in addition to the feldspar, are quartz, calcite, and mica. No attempt has been made to prospect the titanium deposits.

On the west side of the range, east of Camp Bolivia, is the almost forgot Cornish Camp, situated in St. Clair Canyon. In the early seventies, John C. F and associates, of Unionville, Nev., did considerable prospecting here on quar veins carrying silver, but there is no record of any production.

In the Copper Kettle district in Grimes Canyon on the west side of the ra a number of copper claims were located in 1908 by J. R. Bunch, Andrew Robert, others. In 1917 several carloads of copper ore was shipped, and in 1929 11 t

18/ Whitehill, H. R., Report of the State Mineralogist of the State of Nevada the years 1877 and 1888: Carson City, Nev., pp. 65-66.

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s shipped from the Copper Kettle mine. Ore occurs near a contact of diorite l altered porphyry and contains chalcocite, cuprite, copper carbonates, and e silver.

In New York Canyon are some old prospects that were active in the sixties, l it is said that George Hearst had his first Nevada mining experience here. arrastra was built in the mouth of the canyon by Judge Sam Bonnefield of nemucca in the sixties, in which a small amount of ore was treated.

In Fenstonemaker Canyon, also on the west side of the Stillwater Range, are eral antimony prospects that were discovered in the early days, but they have n inactive for many years and there is no record of any production.

TOY DISTRICT

The Toy district is in the northwest corner of Churchill County near the shing County boundary line. It lies in a group of low hills in the south- stern part of the Trinity Range and forms the northwest border of the Humboldt er Valley. The only important property in the district from the viewpoint of st production is the Toy tungsten mine.

According to John T. Reid of Lovelock, the first locations in the district e made in 1885 by Paul Trombley for gold and silver, but no deposits of these als were found and the claims were soon abandoned. In 1907 Peter Anderson son, A. M. Anderson, of Lovelock, located a group of four claims for gold. 1908, lessees, while prospecting the Anderson claims, discovered a heavy te concentrate by panning. Some of the rock was sent to David Atkins, a ing engineer of San Francisco, who at the time was interested in the scheelite osits at Atolia, Calif. Atkins determined the white concentrate to be scheelite, the claims were purchased by Atkins and associates, who formed the St. Anthony es Co., a subsidiary of the Atolia Mining Co. of Calif. The determination of eelite in the Toy mine is of especial interest, since it was the first one of many contact metamorphic deposits of tungsten ore subsequently discovered in United States. The claims were patented and little work was done until 5, when the price of tungsten concentrates rose considerably owing to the and imposed by the World War. In 1915, 20 tons of scheelite ore was mined and pped to Atolia, Calif., for experimental purposes. In the same year a 75-ton vity-type concentrator was erected at Fanning siding on the main line of the thern Pacific R. R. 2-1/2 miles from the mine and 2 miles southwest of Toy ing on the same railroad. The claims were developed and the mill was operated 1916 and 1917 by the company, and for a short time by lessees in 1918, when price of tungsten dropped and operations were discontinued. It is said that first shipment of concentrates from the Fanning mill more than paid for the chase price of the property, the cost of equipping the mine, and the erection the concentrator. Since 1918 the property has been inactive. The mill was mantled in 1921.

Toy Mine

The Toy mine, comprising the Tip Top group of five patented claims owned by Atolia Mining Co., is 4-1/2 miles by road a little south of west from Toy tion house and 20 miles southwest of Lovelock, the county seat of Pershing

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County. The property is developed by a single-compartment inclined shaft 200 feet deep, several short adits, open-cuts, and other workings totaling about 1,500 feet. The only equipment on the ground is a 50-ton ore bin.

The scheelite occurs in lens-shaped deposits along a limestone-granite contact traceable on the surface along the north side of a small ravine for nearly 3/4 mile. The limestone is thin-bedded, with a prevailing strike of about S. 70° W. and dipping from 50° to 80° SE. Along the contact three ore bodies have been mined, and the width of the stopes, as seen from the surface, ranges from 3 to 10 feet. As a rule, the ore occurs in the limestone, but in places some ore has been mined within the granite for several feet from the contact. The scheelite is fine-grained associated with garnet, quartz, calcit diopside, and other contact metamorphic minerals stained with iron oxide near the surface from the alteration of pyrite.

The tailings at the old Fanning mill site have been located as a placer claim by Arthur T. Green and associates, of Lovelock. The tailings have been scattered over a considerable area, but probably about 6,000 tons could easil be gathered for re-treatment if the scheelite content justified a re-treatmen operation. Water for former milling operations was obtained from a well at t edge of the Humboldt Sink a short distance from the mill site.

Hardscrabble Claim

The Hardscrabble tungsten claim owned by Herbert Hamlin, of Reno, Nev., 2 miles west of Toy section house and about the same distance east of the Toy mine. This claim was part of a group located in 1915, when the St. Anthony Mines Co. became active in the district. The claims were allowed to lapse, a the principal claim on which virtually all the work was done was relocated by Hamlin in 1936. At the time of the writer's visit the property was inactive. Development consists of several shallow shafts, the deepest not more than 20 feet, a short adit, and several open-cuts. From the appearance and extent of the workings, no scheelite ore has been produced. There is no equipment on t property.

The formation is thin-bedded shale striking northwest and dipping 40° NE The shale is intruded by granite, and along the contact the shale is metamorp into a fine-grained aggregate of contact minerals, composed chiefly of garnet epidote. The scheelite is fine-grained and invisible to the unaided eye.

WHITE CLOUD DISTRICT

The White Cloud district is in the vicinity of the canyon of the same na on the west slope of the Stillwater Range, 33 miles northeast of Stillwater a 35 miles southeast of Lovelock, Pershing County, on the Southern Pacific R. R The camp of Coppereid is in the central part of the district. According to a news item in an early issue of the Reese River Reveille, a newspaper publishe at Austin, Nev., the district was discovered by Maj. B. B. Bee and Frederick in 1868, but because of difficulties with the Indians it was not organized un 1869. The first work in the district was done in the early seventies by

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ohn C. Fall of Unionville, Nev., who was one of the prominent early-day mine perators in the State. A small copper smelter which operated for a short ime, was erected at the mouth of White Cloud Canyon in the nineties. The evada United Mining Co., under the management of J. T. Reid of Lovelock, arried on extensive prospecting operations from 1906 to 1912. Since 1912 here has been no activity. The only production has been several carloads of and-sorted copper ore from surface workings. One carload shipped by the evada United Mining Co. averaged 26 percent copper and contained $1 in gold nd 1 ounce of silver to each percent of copper.

Nevada United Mining Co.

The Nevada United Mining Co., controlled by John T. Reid of Lovelock, Nev., wns a group of six patented claims at Coppereid in White Cloud Canyon on the est slope of the Stillwater Range. When the company was active, the number of atented claims totaled 33, but all except six reverted to the county for non-ayment of taxes.

The workings comprise an adit 3,050 feet in length, several shorter adits, nd scattered surface workings totaling about 5,000 feet. There is no mining quipment on the property.

The prevailing formation is granite porphyry intruded into a sedimentary eries composed of limestone, calcareous shales, and several beds of gypsum. he sediments have been metamorphosed by the granite intrusion into hornfels, nd small bodies of copper ore of contact metamorphic origin occur in a broad one of mineralized limestone. The copper is associated with masses of specular ematite with variable strike and dip. Along the contact zone the minerals are arnet, epidote, fluorite, quartz, pyrrhotite, pyrite, sphalerite, and chalcopy-ite, in addition to the hematite. Near the surface the primary copper mineral, halcopyrite, has been altered to malachite and chrysocolla.

According to Reid, the main adit crosscutting metamorphosed limestone and hales has a course of S. 30° E., and at a point 1,300 feet from the portal, a ody of disseminated sphalerite about 20 feet in width was exposed. This deposit ssayed 4-1/2 percent zinc but carried no gold or silver. The point in the adit here the zinc deposit was found is about 500 feet vertically from the surface. t 2,600 feet from the portal of the adit some lead, zinc, silver ore was penetrat-l that assayed 5 percent zinc, 4 percent lead, and 3 ounces in silver per ton. o lateral work was done on either of the deposits. At the end of the adit a rge mass of iron ore was cut, on the north side of which several feet of copper e, consisting chiefly of chalcopyrite, was found. The face of the adit is about 800 feet vertically beneath the surface. No copper deposits large enough for ofitable exploitation were found during the course of prospecting operations. hen the adit was driven, the work was hampered considerably by a large flow of ter, which during the period of maximum flow amounted to more than 1,000,000 llons per day.

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WONDER DISTRICT

The Wonder district is on the west slope of a southern spur of the Alpine range, sometimes called the Augusta Mountains, in west Churchill County. It is 55 miles by road east of the town of Fallon, the nearest railroad point; 40 of the 55 miles are over the paved Lincoln Highway and the remaining distance is over fair desert road with an easy grade from the highway to the camp, the rise being approximately 2,000 feet in 15 miles. The elevation of Wonder is 5,500 feet.

The first location in the Wonder District was made in April 1906 by T. J. Stroud on the Jackpot group of claims, and the Nevada Wonder mine was located shortly afterward by Murray Scott, William Mays, and others. The discovery of rich silver-gold ore started a stampede from Fairview that began in May in the same year, and in a few weeks over 1,000 locations were made. The discovery attracted considerable attention, and it was not long before a camp of several thousand people was established. In the first few years of the camp's history, a number of companies were organized, but the bulk of the metal yield was derived from the Nevada Wonder mine, incorporated in Delaware on September 19, 1906. Later this mine was taken over by a group of eastern capitalists, who began a systematic development campaign and in 1913 constructe a 200-ton cyanide mill at the mine. Electric power was brought in from Bishop, Calif., and at the time this transmission line had the distinction of being the longest in the world. The Nevada Wonder Mining Co. controlled, by stock ownership, the claims of the Wonder Extension, reorganized North Star, and Hidden Treasure mining companies, totaling 401 acres, 328 of which were patented. In 1910 water was brought to the camp by a gravity pipe line from Horse Creek, a distance of 10 miles. The company ceased operations in December 1919, after a very profitable history. The total amount of dividends paid was $1,549,002. In 1924 the mine equipment was dismantled and most of it sold. In 1935 the mine and the equipment remaining was purchased by L. F. Curtis of Reno, Nev. In recent years, mining in the district has been by lessees, largely at the Nevada Wonder mine.

The production of the district from 1907 to 1937, inclusive, was $5,952,7 as shown in table 4.

Nevada Wonder Mine

The Nevada Wonder mine comprises five patented mining claims owned by L. F. Curtis, of Reno, Nev. Development consists of a main three-compartment vertical shaft 1,342 feet deep and an auxiliary shaft 2,000 feet distant sunk to a depth of 800 feet, from which various subshafts and winzes attain a maxim depth of 2,000 feet from the surface. Total underground workings comprise abo 8 miles. The lower workings are caved and inaccessible.

Equipment on the property includes a 25-horsepower single-drum gasoline hoist, Rix portable compressor, ore bins, wood head frame, blacksmith shop, an mining tools. In the early part of 1939 several sets of lessees were employed in the upper levels of the mine, and the ore was trucked to the custom milling plant at Westgate for treatment. In the first 6 months of 1938 lessees produc 1,347 tons of ore having a gross smelter value of $43,040.39 or an average of $31.95 per ton.

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TABLE 4.- Gold, silver, copper, and lead production from Wonder district, Churchill County, Nevada, 1907-37, in terms of recovered metal
(Compiled by Charles White Merrill, Mineral Production and Economics Division, Bureau of Mines)

r	Lode					
	No. of mines	Ore, Short tons	Gold		Silver	
			Fine ounces	Value	Fine ounces	Value
.....	3	133	356.38	$7,367	10,993	$7,255
.....	6	408	362.13	7,486	79,187	41,969
-10..	-	-	-	-	-	-
.....	1	9,797	2,476.00	51,183	171,900	91,107
.....	1	28,376	7,589.87	156,897	474,316	291,704
.....	1	41,870	9,534.00	197,085	699,163	422,294
.....	4	50,121	9,715.58	200,839	914,547	505,744
.....	2	58,399	9,790.88	202,395	1,175,953	596,208
.....	3	58,142	8,955.89	185,135	1,023,288	673,323
.....	2	55,804	7,512.74	155,302	816,905	673,130
.....	5	49,741	4,883.41	100,949	603,528	603,528
.....	5	40,604	5,622.71	116,232	467,283	523,357
.....	4	1,218	517.57	10,699	14,505	15,810
.....	1	2	1.63	34	2	2
.....	2	24	14.89	308	1,755	1,755
.....	-	-	-	-	-	-
.....	1	1	.38	8	86	58
.....	-	-	-	-	-	-
.....	1	100	102.67	2,122	902	563
-30..	-	-	-	-	-	-
.....	3	416	245.20	5,069	13,377	3,879
.....	1	200	13.80	285	214	60
.....	-	-	-	-	-	-
.....	4	1,697	1,173.76	41,023	2,619	1,693
.....	2	233	42.76	1,497	14,648	10,528
.....	3	364	133.86	4,685	14,009	10,850
.....	3	705	294.00	10,290	24,970	19,315
otal.	-	398,355	69,340.11	1,456,890	6,524,150	4,494,132

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TABLE 4.- Gold, silver, copper, and lead production from Wonder district, Churchill County, Nevada, 1907-37, in terms of recovered metal (cont'd)
(Compiled by Charles White Merrill, Mineral Production and Economics Division, Bureau of Mines)

Year	Lode					
	Copper		Lead		Total value	Average recoverable value of ore per ton 1/
	Pounds	Value	Pounds	Value		
1907.....	-	-	-	-	$14,622	$109.94
1908.....	-	-	-	-	49,455	121.21
1909-10...	-	-	-	-	-	-
1911.....	-	-	-	-	142,290	14.52
1912.....	-	-	-	-	448,601	15.81
1913.....	-	-	-	-	619,379	14.79
1914.....	-	-	62	$2	706,535	14.10
1915.....	-	-	-	-	798,603	13.67
1916.....	4,564	$1,123	3,350	231	859,812	14.79
1917.....	-	-	-	-	828,432	14.85
1918.....	1,336	330	602	43	704,850	14.17
1919.....	-	-	-	-	639,589	15.75
1920.....	-	-	36	3	26,512	21.77
1921.....	-	-	-	-	36	18.00
1922.....	-	-	-	-	2,063	85.96
1923.....	-	-	-	-	-	-
1924.....	-	-	-	-	66	66.00
1925.....	-	-	-	-	-	-
1926.....	-	-	-	-	2,685	26.85
1927-30...	-	-	-	-	-	-
1931.....	-	-	-	-	8,948	21.51
1932.....	-	-	-	-	345	1.73
1933.....	-	-	-	-	-	-
1934.....	-	-	270	10	42,726	25.18
1935.....	-	-	-	-	12,025	51.61
1936.....	-	-	-	-	15,535	42.68
1937.....	-	-	-	-	29,605	41.99
Total	5,900	1,453	4,320	289	5,952,764	14.94

1/ Not to be confused with average assay value of ore.

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The country rocks are a complex series of Tertiary eruptives - rhyolite, dacite, andesite, and basalt. The Wonder rhyolite is the principal ore-bearing formation. A number of veins occur, most of which contain small deposits of silver-gold ore, but the principal vein from which the major part of the production has been mined is the Nevada Wonder, whose outcrop extends 1-1/4 miles along the strike.

According to Burgess[19] the Nevada Wonder vein lies partly on the contact between rhyolite and the intrusive body of dacite, but toward the north the vein leaves the contact and lies entirely within the rhyolite. The strike is N. 25° W. and the dip is 75° NE. The widths of the oreshoots range from a few feet to a maximum of 30 feet, averaging between 5 and 6 feet. The values are silver and gold in a gangue of quartz, feldspar, and occasional small quantities of fluorite. The gangue is generally stained yellowish-brown with limonite; some of the ore is white. No water is present in the workings, and oxidization extends to the 1,300-foot elevation in the mine. The silver is in the form of argentite and halogen salts, and the gold is both native and combined with argentite. The silver haloids found are embolite, iodobromite, and iodyrite. The ratio of gold to silver by weight, according to production statistics, has been 1 to 94. Oxide of manganese occurs in small dendritic forms, while copper and lead occur only in traces.

Near the surface, where the walls of the vein were firm and stood well, the ore was mined by the shrinkage method. Below the 400 level the walls were less firm, and mining was done by the cut-and-fill system, waste for filling having been obtained from raises driven either into the hanging or foot wall.

19/ Burgess, J. A., the Halogen Salts at Wonder, Nev.: Econ. Geol., Vol. 12, 1917, pp. 589-593.

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